MCG 8100
Tank Monitoring System

Installation & Operating Manual

L&J ENGINEERING

an *L&J TECHNOLOGIES* Company

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MCG 8100 TANK MONITORING SYSTEM

INTRODUCTION

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SECTION I - SAFETY INFORMATION

READ THIS IMPORTANT SAFETY INFORMATION BEFORE STARTING UP OR OPERATING A MCG 8100

This product has been installed and will operate in the highly combustible environment of a gasoline storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from death, serious injury, explosion or electrical shock.

For safety reasons, we have taken particular care in the design of this product to limit the power in the wiring to the fuel tanks and to keep that wiring physically separated from any other wiring.It is your responsibility to maintain the effectiveness of these safety features by starting up and operating this product in accordance with the instructions and warning which follow. Failure to do so could create danger to life and property.

Leaking underground tanks can create serious environmental and health hazards. It is your responsibility to operate the product in accordance with the instructions and warnings found in this manual.

Failure to start up and operate this product in accordance with the instructions and warnings found in this manual will result in voiding all warranties connected with this product.

WARNINGS:

EXPLOSION COULD OCCUR IF OTHER WIRES SHARE MCG 8100 PROBE WIRE CONDUITS OR WIRING TROUGHS. CONDUITS AND WIRING TROUGHS FROM PROBES TO THE MONITOR MUST NOT CONTAIN ANY OTHER WIRES.

EXPLOSION AND/OR EQUIPMENT DAMAGE COULD OCCUR IF CONDUITS DO NOT ENTER THE MONITOR THROUGH THEIR DESIGNATED PREFORMED KNOCKOUTS.

IN INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE; NFPA NO. 70; AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA NO. 30A); FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

TO AVOID ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY, BE SURE AC POWER TO THE MONITOR IS OFF DURING INSTALLATION.

READ CAREFULLY THE OPERATING INSTRUCTIONS AND WARNINGS FOUND IN THIS MANUAL AND ON THE WARNING LABEL AFFIXED TO THE FRONT PANEL OF THE SYSTEM MONITOR. FAILURE TO DO SO COULD RESULT IN UNDETECTED ENVIRONMENTAL AND HEALTH HAZARDS.

FAILURE TO COMPLY WITH THESE REQUIREMENTS COULD RESULT IN SERIOUS PERSONAL INJURY, PROPERTY LOSS, EQUIPMENT DAMAGE, AND UNDETECTED POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS.

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY

CIRCUITRY WITHIN THE PROBE AND CONSOLE BARRIER FORM AN INTRINSICALLY SAFE, ENERGY LIMITED SYSTEM. THE SYSTEM MAKES THE MCG 8190A/8150A PROBE INTRINSICALLY SAFE FOR USE IN A CLASS I, GROUP D HAZARDOUS LOCATION. THE PROBE WIRING IS INTRINSICALLY SAFE ONLY WHEN CONNECTED TO L & J'S MCG 8100 TANK MONITOR.

DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE L & J "SITE PREPARATION AND INSTALLATION INSTRUCTIONS"; THE NATIONAL ELECTRICAL CODE; NFPA NO. 70; AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA NO. 30A); FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

SECTION II - PREPARATION CHECKLIST

Before you start checkout and setup procedures for this MCG 8100 Tank Level Sensor, be sure you have the materials and information shown on this checklist.

MANDATORY

* 3M Sealant Kit (one per probe, furnished with each probe).
* Warranty Registration and Checkout Form
* MCG 8100 Manual, Installation Instructions
* Tank specifications including material, diameter, volume.
* Tank height-to-volume conversion chart. (Strapping table).
* Probe installation hardware: 1 water float and 1 product float.

OPTIONAL

Listed below are optional setup parameters. Enter desired values in the appropriate spaces. Having this information established will save time and inconvenience during setup.

Night Move Start Time: __:__ (AM/PM)
Night Move Stop Time: __:__ (AM/PM)
Auto Print Time #1: __:__ (AM/PM)
Auto Print Time #2: __:__ (AM/PM)
Auto Print Time #3: __:__ (AM/PM)
Auto Print Time #4: __:__ (AM/PM)
Auto Print Time #5: __:__ (AM/PM)
Auto Print Time #6: __:__ (AM/PM)

FUNCTION	Tank Number #1	#2	#3	#4	#5	#6	#7
High Water Alarm Limit (Inches/mm)							
Overfill Alarm Limit (Inches/mm)							
Low Level Alarm Limit (Inches/mm)							
Theft Alarm Limit (Gallons/Liters)							
Leak Alarm Limit (Gallons/Liters)							
API Gravity (Calculated by 8100)							
Tank Diameter (Inches/mm)							
Product Label Code							
Manifolded Tank Configuration (Tank)							

*Fuel height readings at the fill riser and probe riser should have been taken for each tank at the time of probe installation and recorded in the MCG 8100 Monitor Installation Instructions.

When you are finished programming the MCG 8100 Tank Monitor, make a copy of the parameters using FUNCTION 125. Keep a copy inside the box for future reference.

SECTION III - LIMITATION OF REMEDY AND WARRANTY

A. WARRANTY - We warrant that this product will be free from defects in material and workmanship for a period of one (1) year from the date of installation or fifteen (15) months from date of invoice, whichever occurs first. During the first ninety (90) days of this warranty period, we or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use and at no charge to the purchaser. After the first ninety (90) days of the warranty period, we or our representative will repair or replace the product if it is returned to our factory, transportation prepaid, within the warranty period and is determined by us to be defective. We will not be responsible for any shipping expenses incurred by the user.

This warranty applies only when the product is installed in accordance with our specifications, and a Warranty Registration and Checkout Form has been filed. The user shall maintain all inventory reconciliation records from date of installation. This warranty will not apply to any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.

B. INSPECTION - You shall inspect the product promptly after receipt and shall notify us at our Hillside office in writing of any claims, including claims of breach of warranty, within thirty days after you discover or should have discovered the facts upon which the claim is based. Your failure to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.

C. LIMITATION OF REMEDY AND WARRANTY - The provisions of Paragraph A are our sole obligation and exclude all other remedies or warranties, express or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.

D. LIMITATIONS OF DAMAGES - Under no circumstances shall we be liable for any incidental, consequential or special damages, losses or expenses arising from this contract or its performance or in connection with the use of, or inability to use, this product for any purpose whatsoever.

LIMITATION OF ACTIONS - No action regardless of form arising out of this contract may be commenced more than one year after the cause of action has accrued, except an action for nonpayment.

COLLATERAL PROMISES - There are no representa-

tions, warranties, or conditions express or implied, statutory or otherwise except those herein contained, and no agreements or waivers collateral hereto shall be binding on either party unless in writing and signed by you and accepted by us at our Hillside office.

SECTION IV - WARRANTY REGISTRATION AND CHECKOUT

Intrinsic Safety Check:

Be sure power is off before starting this intrinsic safety check.

1. Check to be sure probe wires are contained in a separate, dedicated rigid conduit.

WARNING: EXPLOSION COULD OCCUR IF OTHER WIRES SHARE MCG 8100 PROBE WIRE CONDUITS OR WIRING TROUGHS. CONDUITS AND WIRING TROUGHS FROM PROBES TO THE MONITOR MUST NOT CONTAIN ANY OTHER WIRES.

2. Verify that all conduits enter the monitor through preformed conduit knockouts.

WARNING: EXPLOSION AND/OR EQUIPMENT DAMAGE COULD OCCUR IF CONDUITS DO NOT ENTER THE MONITOR THROUGH THEIR DESIGNATED PREFORMED KNOCKOUTS.

3. Open the monitor cover locate the power supply terminal strip TB1 in the lower left corner of the enclosure.

4. Verify that a #12 AWG (or larger) conductor has been connected between the barrier ground, bottom left side of box and the earth ground.

5. Verify that system power is properly wired to a separate, dedicated breaker.

6. Locate the intrinsically-safe barrier cover inside the monitor cabinet, remove the two screws and open the cover.

7. Verify that all probe connections have been made properly using color-coded wires and that the proper color-code designations have been maintained throughout the probe-to-monitor wiring hook-ups. (Red—>, green—>, black—>white—>) PECG.

8. If any discrepancies are found in MCG 8100 wiring or installation, refer to the Installation Instructions for the correct procedures.

9. Close the barrier strip cover and fasten its two screws. Close the monitor cover.

DO NOT APPLY POWER TO THE SYSTEM UNTIL ITS INSTALLATION HAS BEEN CHECKED AND FOUND TO BE IN ACCORDANCE WITH THE INSTRUCTIONS OUTLINED IN THE L & J INSTALLATION INSTRUCTIONS; THE NATIONAL ELECTRICAL CODE; NFPA NO. 70; AUTOMOTIVE AND MARINE SERVICE STATION CODE (NFPA NO. 30A); FEDERAL, STATE AND LOCAL CODES; AND OTHER APPLICABLE SAFETY CODES.

MCG 8100 TANK MONITORING SYSTEM

INSTALLATION

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SECTION I - INTRODUCTION

This section is an overview of the manual and provides safety and warranty information for the MCG 8100 System.

1.1 MANUAL SCOPE

This manual contains the information necessary for the mechanical and electrical installation of the MCG 8100 Monitor. The probes used with the MCG 8100 include:

- MCG 8150 Internal Level Sensing Probe
- MCG 8160 External Liquid Sensing Probe
- MCG 8165 External Floating Hydrocarbon Probe
- MCG 8170 External Vapor Sensing Probe
- MCG 8190 Internal Level Sensing Probe with Density Capability

This manual does not cover the basic procedures involved in installing level control systems, such as conduit and manhole installation. If you are not familiar with these techniques, contact L&J Technologies Systems for advice.

This introduction section covers:

- Terminology
- Overview of MCG 8100 System Operations
- Overview of Mcg 8100 System Installation
- Safety Notices
- Warranty Registration
- Product Warranty Agreement
- Safety Precautions
- Parts and Supplies

For information about programming and operating the MCG 8100 System, refer to the **MCG 8100 Start-up Manual.**

For service help, refer to the **MCG 8100 Service** Manual.

1.2 TERMINOLOGY

Throughout this manual, the term "MCG 8100 Monitor" refers only to the MCG 8100 Control Panel Console. The term "MCG 8100 System" refers to the installed combination of the MCG 8100 Monitor, probes, wiring, and connections.

1.3 OVERVIEW OF MCG 1800 OPERATIONS

The MCG 8100 System provides simultaneous theft, leakage, and inventory control for up to ten underground storage tanks. Based upon conditions detected by the external and internal probes, the monitor keeps track of:

- Product Level
- Product Temperature
- Product Volume
- Water Level
- Water Volume
- Sensor Status
- API Gravity Product
- Specific Gravity

Sensor probes gauge conditions in and around the underground storage tanks and report to the MCG 8100 Monitor, which calculates and reports changes in tank conditions. The system tracks product changes to maintain usable inventory records, detects product leakage or removals, and produces a series of printouts and alarms.

Each MCG 8100 System is individually configured to meet the specific needs of the underground storage tank arrangement.

1.4 OVERVIEW OF MCG 8100 INSTALLATION

This manual is a guide for installing the MCG 8100 System. Three topics that concern system wiring are of particular importance:

1.4.1 EXTERNAL WIRING AND CONDUIT CONNECTIONS

Probe wires must be contained in dedicated rigid conduits, and threaded through preformed knockouts in the monitor.

1.4.2 POWER CONNECTIONS

System power must be wired to a separate dedicated circuit breaker using a #12 or larger AWG conductor.

1.4.3 INTERNAL MONITOR WIRING

All probe wires are color-coded and must be connected in a prescribed order.

All of these areas are detailed in the intrinsic safety checklist found in **Section 4.8.**

1.5 SAFETY NOTICES

The three levels of safety notices used throughout this manual are:

WARNING
Indicates a situation in which personal injury may occur.

Caution
Indicates a situation in which damage to equipment or material may occur.

*** NOTE**

Provides helpful information for proper operation of the MCG 8100 Monitor and sensor probes.

1.6 WARRANTY REGISTRATION

L&J Technologies Systems holds the service technician who starts up the MCG 8100 Monitor responsible for checking that all installation work is performed in accordance with the directions in this manual, and with all applicable laws.

Modifications to the prescribed installation and incorrect installation automatically void the warranty for the MCG 8100 System. Therefore, check installation procedures carefully.

Caution
Improper installation automatically voids the product warranty agreement.

To comply with the warranty agreement, also fill out and return the "Warranty Registration and System Check Form" to L&J Technologies Systems within fourteen days of installation.

1.7 PRODUCT WARRANTY AGREEMENT

The MCG 8100 System is certified to be free from defects in material and workmanship and will be covered under the warranty agreement for one year from the date of installation, or fifteen months from the date of invoice, whichever occurs first. An L&J Technologies Systems' certified service technician will repair or replace the product on site, free of charge, if the problem occurs or is discovered during the first ninety days of the warranty period. If the problem occurs or is discovered after the first ninety days but before the end of the warranty period, L&J Technologies Systems will repair or replace the product at the factory, on the condition that the customer returns it, postage paid, before the end of the warranty period. These conditions apply to the MCG 8100 System warranty:

- An authorized service technician must start up the system.
- The system must be installed in accordance with the specifications in the MCG 8100 Installation Manual.
- The user must maintain all inventory reconciliation records from the date of installation.
- The warranty is invalid and L&J Technologies Systems disclaims any responsibility for injury or property damage

if the MCG 8100 System has been subjected to misuse or negligence, misapplied, used in violation of product manu als, modified or repaired by unauthorized persons, or improperly installed.

- In order to place a claim, including a breach of warranty, L&J Technologies Systems requires notification of the claim in writing within thirty days of its discovery. Failure to give written notice within that time period forfeits the claim.

- Any action, other than actions for nonpayment,arising from this warranty agreement must be initiated within one year of occurence of the problem.

- No agreements in regards to the warranty are binding unless signed by the customer and accepted in writing by L&J Technologies Systems.

- The ninety day warranty period begins on date of installa tion.

1.8 SAFETY PRECAUTIONS

Monitoring underground tanks involves handling flammable and toxic petroleum products. When installing, operating, and servicing the MCG 8100 System, make sure all activity meets state and local requirements for safe working conditions and procedures.

> **WARNING**
>
> **To guard against burns and explosions from petroleum products, follow proper safety precautions.**

1.8.1 SITE SAFETY REGULATIONS

Site safety regulations take precedence over all other procedures. Failure to comply with such regulations can create danger to life and property.

National electrical codes,NFPA No. 70, Automotive and Marine Service Station code (NFPA No. 30A) federal, state and local codes, and any other relevant codes apply to the use of the MCG 8100 Monitor and all sensor probes used with it.

Follow these safety regulations:

* Keep all flames and sparks well away from the tank site.

* Do not smoke at the tank site at any time.

* Avoid skin contact with gasoline and other fuels.

* Wear safety glasses at all times to protect eyes from accidental contact with product.

* Take procautions to prevent accidental product spills which can damage soil and vegetation or contaminate ground water.

* Dispose of all extra product and cleaning materials in a proper manner.

1.8.2 SAFETY CHECK

Pay attention to the safety areas listed in this checklist.

- Flammable materials may be exposed while checking for proper installation. Make sure that extension cords around the site are not frayed, and that instruments or machines in the vicinity will not spark. Do not smoke or have an open flame around the tank site.

- Extra wires in the probe wire conduits or wiring troughs may cause an explosion. Check that no additional wires were added during installation. Never place any wires in the probe wire conduits and wiring troughs not specifically called for in the MCG 8100 Installation Manual.

- The conduit must enter the monitor through its designated preformed knockout. Failure to follow this directive may cause an explosion and/or equipment damage.

- The MCG 8100 Monitor must not be installed in a volatile, combustible, or explosive atmosphere (Class I, Division 1).

- Power to the monitor must be shut off when handling wiring or electrical connections. Contact with wiring or electrical connections may result in death, electrical shock, or other personal injury.

> **Caution**
>
> **Failure to operate the MCG 8100 System in accordance with these safety precautions voids the product warranty agreement and can damage the equipment.**

1.9 JOB SITE REQUIREMENTS

Site conditions and installation requirements will vary from one job to another. The installing technician must apply proper judgement in adapting these instructions to fit the particular requirements of the job. If you encounter unusual job site conditions that would require significant deviation from the guidelines in this manual, contact L&J Technologies Systems for advice.

1.10 PARTS AND SUPPLIES

Each MCG 8100 System includes the monitor, specified probes, floats, and interfaces as required for each individual application. Depending upon the requirements of the job site, you will need additional tools and supplies to install the MCG 8100 System.

* Cable: color-coded, 22 gauge stranded copper wire that is equivalent to Belden 88723. This item can be purchased thru L & J (part# 759223). See **Section 4-1** for more information about the cable.

* Conduit

* Joint Sealant

* Splice Kit: wire nuts are not recommended; use a splice kit that will provide waterproof connections.

* Surge Suppressor

SECTION II - SITE PREPARATION

This section covers system setup procedures prior to installing the MCG 8100 and its accompanying sensor probes.

2.1 INTRODUCTION

Before actually installing the MCG 8100 System, you need to prepare the site. Site preparation involves:

- Preparing the Vapor Wells
- Attaching the Probe Riser Pipe
- Assembling the Manhole
- Installing the Junction Boxes
- Routing the Conduits

This section describes installation procedures for each of the above components.

2.2 NO VEHICLES

To allow for an accurate and methodical installation, keep moving vehicles and all other unrelated activity away from the job site. No product can be pumped, either in or out of the tanks, while you are installing and assembling the system.

Caution

There should be no product movement operations taking place during MCG 8100 installation. Vibrations from vehicles and pumping of product may loosen connections, make measure-ments inaccurate, or damage sensitive equipment.

2.3 MONITORING WELLS

Each 8165 and 8170 Probe requires a monitoring well next to the tank. The vapor well and tank must meet the following specifications:

- The vapor well must extend one foot below the bottom of the tank.
- The 0.010 inch slots must be entered in the bottom two feet of the well so that water can flow in and out of the well.
- A few slots must always be exposed above the water table, so that vapor from the soil can get into the well.

2.4 TANK ACCESS

Each tank requires an individual probe riser pipe. If the tank is not uncovered at the desired site, verify that the tank can be exposed at that point and that a riser pipe location is available.

Probe riser pipes should be placed as demonstrated in **Illustration 2-1.** To install the probe riser pipe:

1. Clear away a space to access the hole for tanks that are buried.
2. Select a threaded hole close to the center of the tank. Make sure space is available for a manhole-covered sump.
3. Remove plug or cap from the hole on the tank.
4. Insert a four inch ANSI Schedule 40 riser pipe. Allow at least three inches between the top of the probe and the bell reducer.
5. Reduce the four inch opening down to a half inch tapped opening. A half inch cord grip is supplied with each MCG 8190/8150A. Either a bell reducer (shown in Illustration 2-1) or an Evertite cap is acceptable.

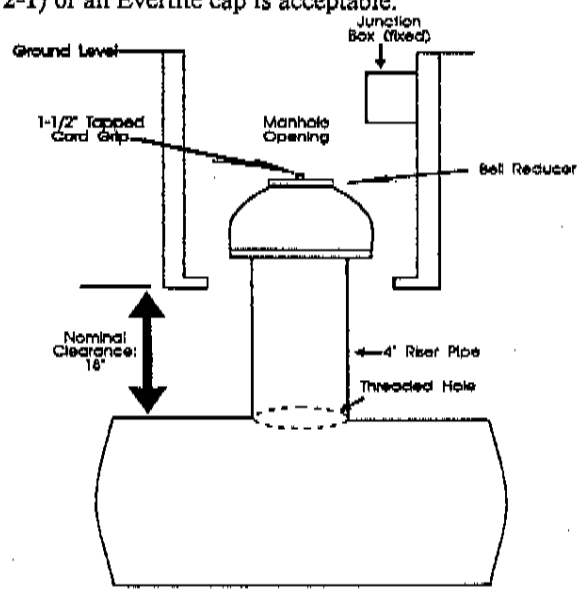


Illustration 2-1
Probe Riser Installation

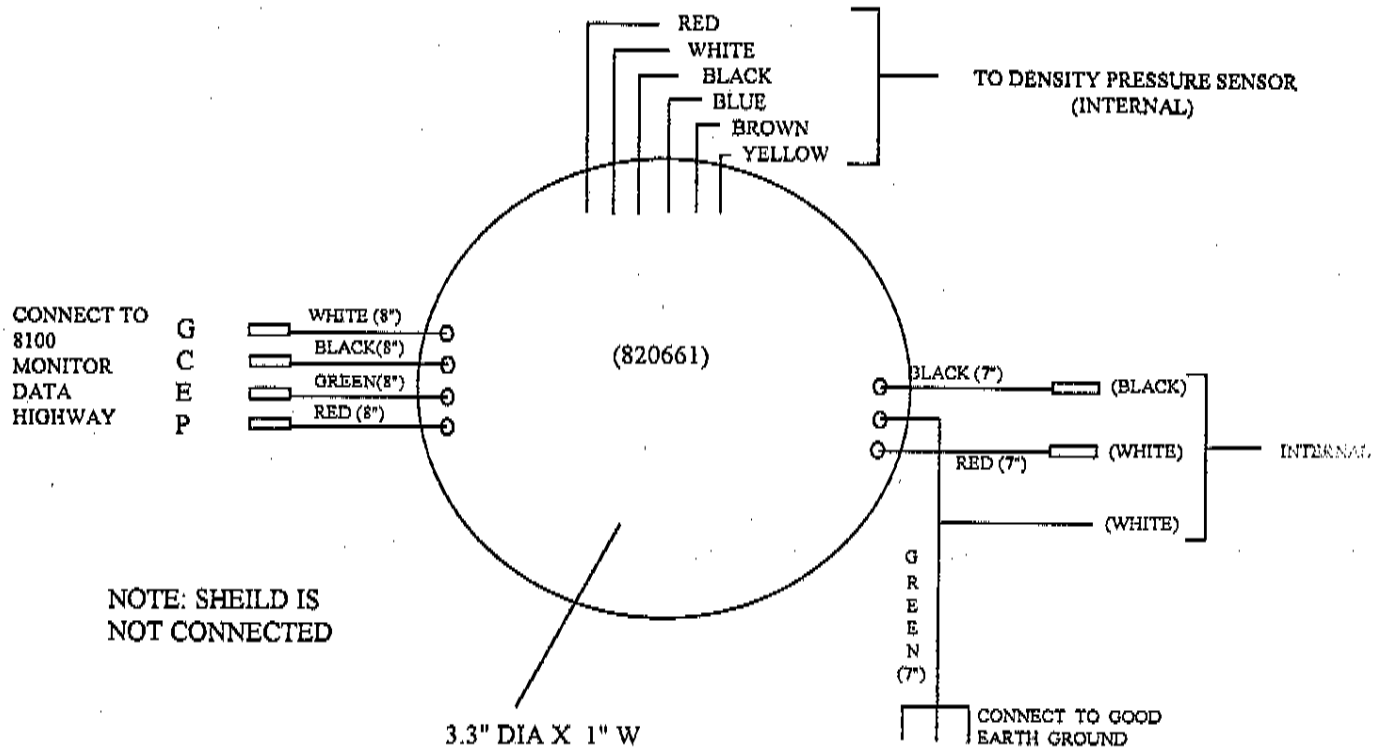


Illustration 2-2
Hockey Puck Interface for 8190 Probe

2.5 ASSEMBLING THE MANHOLE

An 18 inch manhole provides adequate access to the probe location. Install the manholes in accordance with standard manhole installation procedures. Leave enough room to install a junction box and accommodate the manhole liner.

2.6 INSTALLING THE JUNCTION BOXES

Waterproof electrical junction boxes with gasketed covers protect wiring connections used in the MCG 8100 System. Each tank requires a probe junction box close to the probe riser. All of the probe cables from an individual tank are routed through the probe junction box.

2.6.1 JUNCTION BOX REQUIREMENTS

All monitoring probes except the MCG 8165 are wired into the system through attachments to a prewired black disk called a "hockey puck" interface. Each interface is to be mounted in a junction box. Make sure the junction box is large enough to accommodate the hockey puck, spliced wire connections, and the bundle of extra wire from the probe. The MCG 8190/8150A contains an internal hockey puck as shown in Illustration 2-2.

2.7 ROUTING THE CONDUITS

A half inch rigid conduit passes from the probe junction boxes to the preformed knockout underneath the monitor. The conduits extending from each probe junction box should be spliced to a single conduit run before entering the monitor.

2.7.1 PLANNING THE CONDUIT ROUTE

Although there are many ways to attach the conduits, **Illustration 2-3** shows three methods: acceptable; preferred; and incorrect.

Follow these instructions to plan the conduit route.

1. Decide which conduit field configuration is appropriate for the tank arrangement. Your objective is to keep the length of wire runs to a minimum. Unnecessarily long wiring runs could contribute to reduced strength and clarify of the transmitted signal.

2. For MCG 8160 liquid sensors, keep the distance between the interfaces and the probe to 30 feet or less.

3. Measure the distance between:

   *each junction box and conduit splice

   *the conduit splice and the monitor

4. Add the distance between the probe junction box and the conduit splice and conduit splice to the conduit splice and the monitor for each probe. If the total distance exceeds 250 feet, contact L&J Technologies Systems for assis tance before continuing with the installation.

2.7.2 LAYING THE CONDUIT

When laying the conduit, make sure the conduit is high enough above the groundwater level to prevent water from entering. Lead a single conduit into the monitor junction box.

Caution
If water enters the conduit, wiring can be destroyed and signals disrupted.

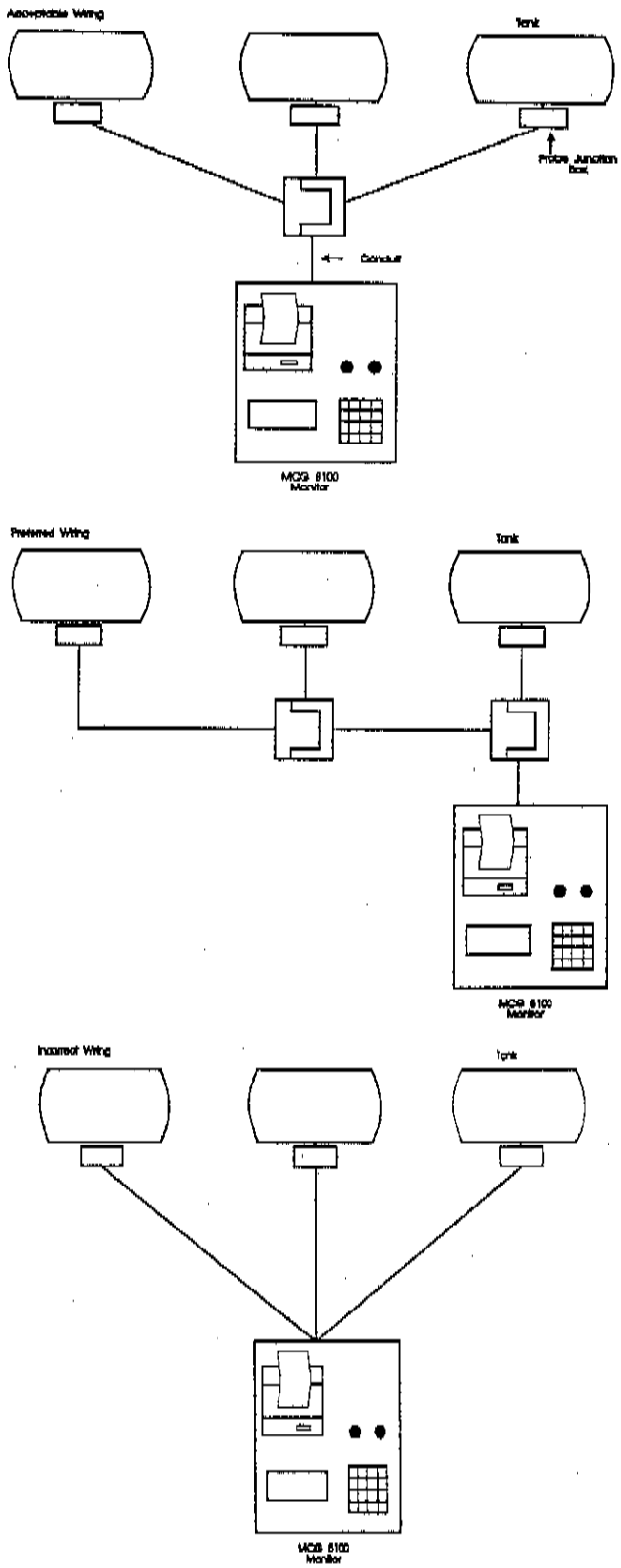


Illustration 2-3
Wiring Options

SECTIONIII- MONITOR INSTALLATION

This section explains how to wire and mount the MCG 8100 Monitor.

3.1 INTRODUCTION

The MCG 8100 Monitor is a wall-mount unit that must be protected from the weather. It is not equipped for outdoor installation.

Monitor installation involves the following:

*Wiring the power and internal monitor

*Mounting the monitor

*Checking the wiring and voltage

3.2 INTERNAL MONITOR WIRING

Illustration 3-1 shows the internal wiring path for the monitor. Before mounting the monitor on the wall, make the wiring connections inside the monitor. Do not connect the power supply to the circuits until all other wiring is complete.

WARNING
Applying power to a circuit before wiring is complete can cause death, electric shock, or equipment damage.

Follow these instructions for internal wiring:
1. Route two wires from the charger jack to the TB1 terminals 1 and 2.

2. Connect the green wire to the earth ground lug and route to a good earth ground, such as a cold wire pipe, conduit run, or a lightning rod driven into the ground.

3. Unscrew the shield panel.

4. Connect the field wire to the intrinsic safety barrier. Keep it separate from other wires.

5. Close the shield panel and screw it shut.

3.3 MONITOR MOUNTING

The monitor is not equipped for outside installation. Situate the monitor inside an enclosed building protected from severe vibration, humidity, rain, snow, and temperature extremes.

Caution
Failure to protect the monitor from weather can damage the printer and electronics panel and disturb system operations.

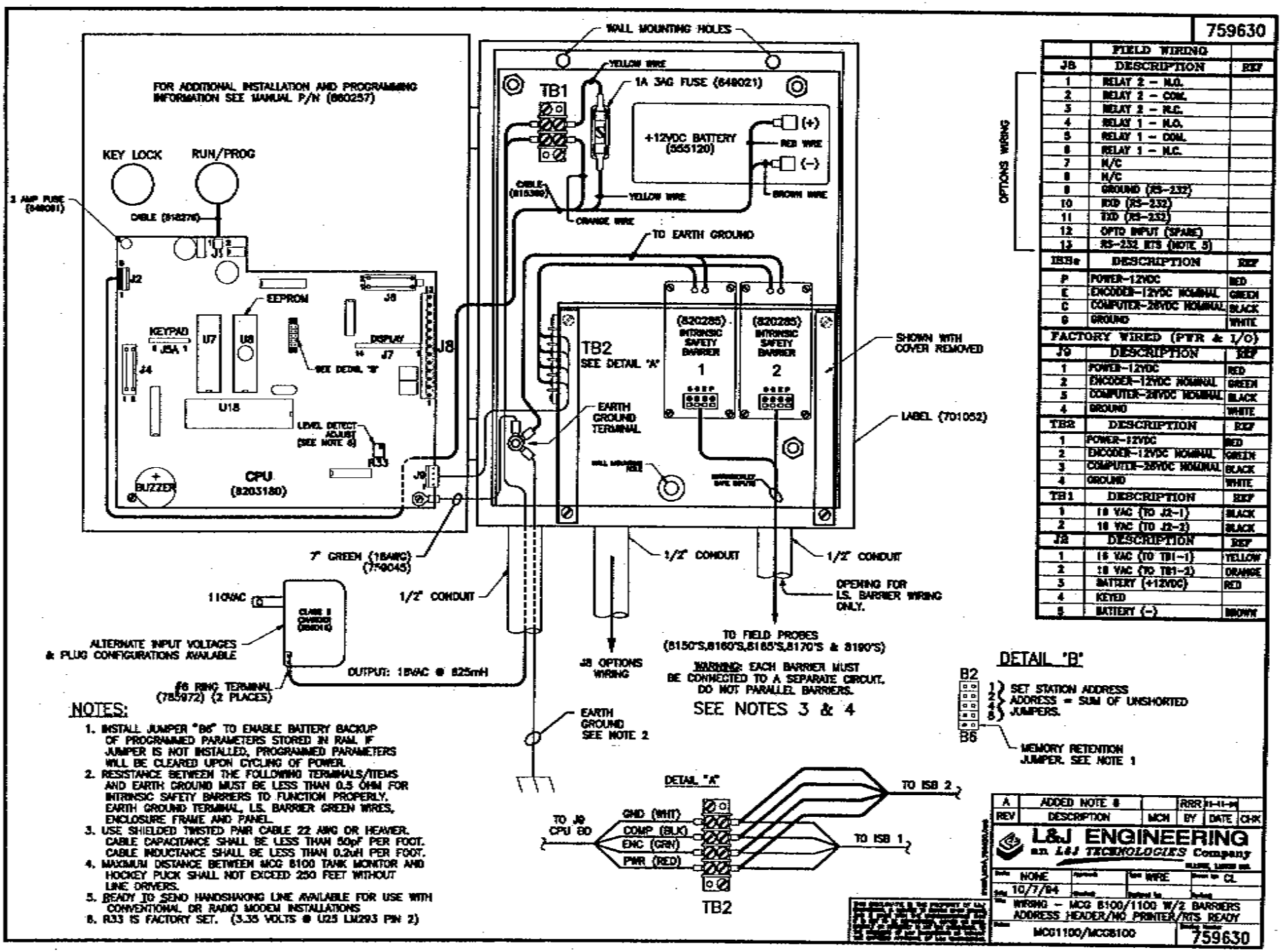
Use these guidelines to install the monitor:
1. Prepare the attachment points shown in **Illustration 3-2.**
2. Fasten the monitor on through the mounting holes located in the back of the monitor case.
3. Insert the conduit through the preformed knockout on the bottom of the monitor and seal with gasket or sealing compound.

3.4 WIRING AND VOLTAGE CHECKS

Once all wiring has been installed, use a voltmeter to confirm the voltage at test points. **Table 3-1** indicates where to check, and what voltage reading is appropriate there. See **Illustration 3-1** for terminals and test points.

Note comments regarding test settings and power status.

TO. CHECK	VOLTMETER TEST POINTS	VOLTAGE SHOULD READ	COMMENTS
AC power	Ground and 1 and 2 on TB1	16 VAC 20%	Check for 120VAC if not 16V
GEL cell	On red and black terminals of the battery	14 VDC	
CPU Board	Between ground on the battery and the L-1 inductor	+4.7 to +5.3VDC	Put voltmeter on low DC voltage range before connecting leads
Lithium Battery	Between positive and negative terminals on underside of CPU	+3 VDC 5%	Unmeasurable by Customer
Supply voltage to all Probes	Across Terminals P,E,C and G	P & E : 10.5 to 14.5VDC C:14.5 to 20.5VDC	C will pulse
Run-Program Key Switch	Orange and yellow wires on plug coming to CPU	1) In PROG mode, wires will be open 2) In RUN mode, wires will be shorted	Disconnect CPU power before connecting leads



SECTION IV - PROBE INSTALLATION

This section covers the installation of the probes used with the MCG 8100 Monitor.

The MCG 8100 Monitor can be combined with any of these probes:

*MCG 8150 Internal Level Sensing Probe

*MCG 8160 External Liquid Sensing Probe

*MCG 8165 External Floating Hydrocarbon Probe

*MCG 8170 External Vapor Sensing Probe

*MCG 8190 Internal Level Sensing Probe with Density

Different probe configurations determine which MCG 8100 System functions operate, since each probe signal supplies information for a different function.

Turn off system power when installing any of the probes.

WARNING

Failure to turn off the power during installation may cause death or electrical shock.

Illustration 4-1 diagrams a tank arrangement with probes 8150, 8160, 8165, and 8170 attached.

4.1 RECOMMENDED PROBE CABLES

For proper probe wiring, use 22 gauge cables made of stranded copper wires, wrapped in red, green, black, and white. The cable must be compatible with the stored product. Since the conduits pass from a Class I, Division 1 area into a non-hazardous area, seal the conduit connections in accordance with the National Electrical Code (NFPA 70) and the automotive and marine service station code (NFPA 30A).

4.2 INTRINSIC SAFETY BARRIERS

The MCG 8100 Monitor is configured to accept up to three intrinsic safety barriers (ISB). As a general rule, more than three 8190/8150A Probes and three 8160 Probes, or more than 1000 total feet of probe wiring will exceed the current draw for one ISB, and will require at least one additional ISB. Although ISBs can be added at any time, they are most easily inserted into the system at time of installation. If there is any reasonable likelihood of future system expansion, the initial installation should include one or more extra ISBs to accommodate added probes. Contact L&J Technologies Systems with any questions regarding the current draw limits or the number of ISBs.

4.3 PROBE WIRING

Probes MCG 8190/8150A, 8160, and 8170 connect with the hockey puck interface as shown in the following illustrations. The MCG 8165 External Floating Hydrocarbon Monitor incorporates the wiring interface within the circuitry; the MCG 8165 connects directly with MCG 8100 Monitor data highway. **Table 4-1** details the connections for each probe model and for each external hockey puck connection to the 8100 Monitor data highway. The following sections are detailed instructions for installing and connecting each of the probes.

4.4 MCG 8190/8150A INSTALLATION

Follow these directions to install the MCG 8190/8150A:

Caution
The probe is a sensitive instrument. During installation, handle with care to prevent damage and to insure accurate monitoring.

Note:
Do not vent probe through riser

1. Unscrew the end cap and place both floats (product float first) on the probe. The heavier water float has a brass plate attached to the bottom. Replace the end cap.

2. Gently lower the probe into the tank through the riser. The end cap should rest on the tank bottom and both guide rings should be in the riser.

3. Feed the cable through the reducing hardware and the cord grip. Secure the reducing hardware to the riser.

4. As shown in **Illustration 4-3**, connect the cable to the appropriate leads on the hockey puck interface, and connect the interface to the MCG 8100 monitor data highway. The interface must be in a waterproof junction box. For MCG 8190/8150A probes, connect the cable as shown in Illustration 4-2.

*** NOTE**
For future servicing convenience, leave plenty of slack and bundle the wires.

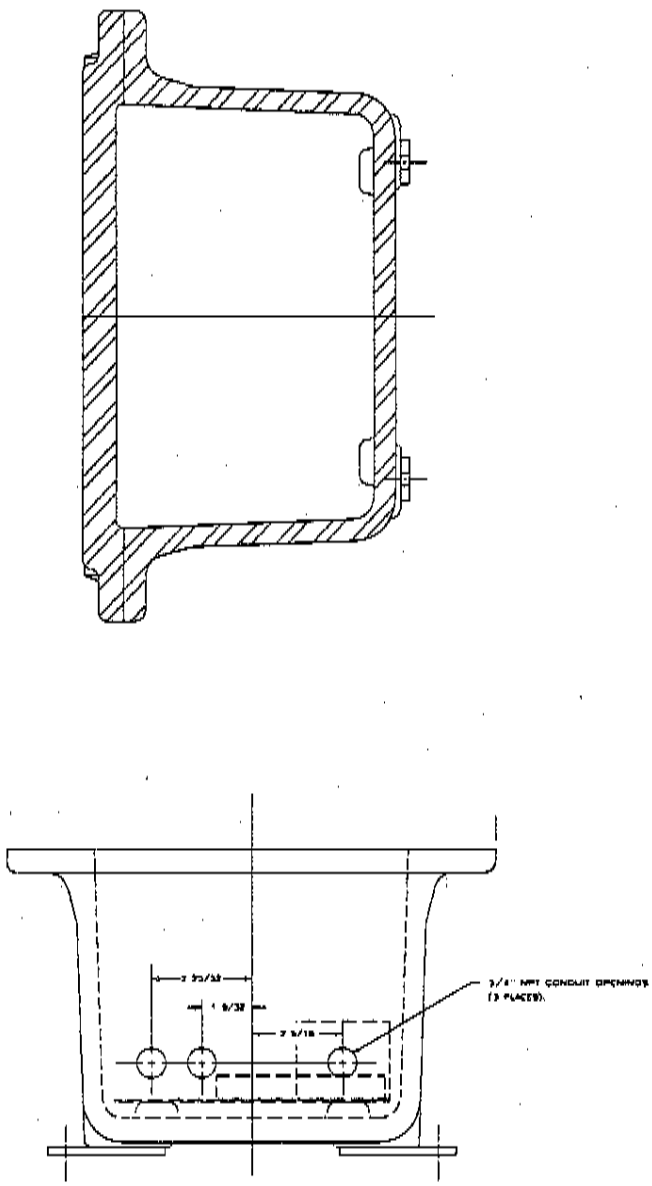
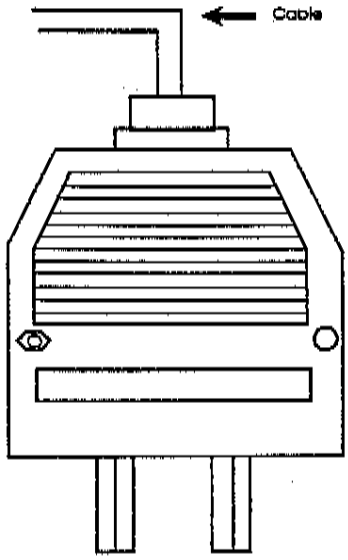


Illustration 3-2
Monitor Mounting Points
(For Nema 7 Explosion - Proof Housing)



4.5 MCG 8160 INSTALLATION

Illustration 4-4 shows the MCG 8160 probe end, and **Illustration 4-5** is a diagram of a typical MCG 8160 installation. **Illustration 4-6** shows the required hockey puck wiring connections.

When the MCG 8160 probe and an MCG 8190/ 8150A Internal Level Sensing Probe are to be installed in the same tank, wiring from both probes can run to one junction box, and both probes can be connected to one hockey puck interface. In this case, you combine the splices shown in **Illustrations 4-3** and **4-6.**

Follow these steps to install the MCG 8160:

1. Check that there is no fluid in the annular space around the tank.

2. Carefully lower the probe through the probe riser and into the annular space until it reaches the bottom.

Caution

The probe is a sensitive instrument. During installation, handle with care to prevent damage, and to insure accurate monitoring.

3. Secure the cable in the riser.

4. Thread the probe cable through the seal on the junction box.

5. Splice the probe cable wires to a "hockey puck" interface within the junction box. Use a splice kit to insure a waterproof connection.

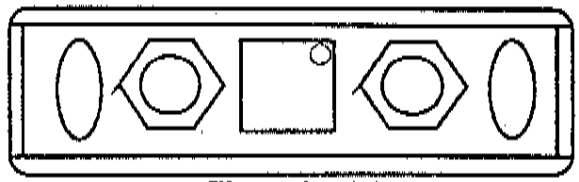


Illustration 4-4
8160 Probe End

4.6 MCG 8165 INSTALLATION

The MCG 8165 does not use a hockey puck interface; the probe wires are spliced directly into the MCG 8100 Monitor data highway. **Illustration 4-7** shows the MCG 8165 probe end and the assembled configuration of the metal weight, guide wire, and threaded sensors. Note that the threaded sensors extend into the water at the bottom of the float. The sensor length is an important dimension. If the sensors extend too far below the surface of the water, no alarms will sound. If the extension is too short, there will be repeated false alarms. For the initial installation, extend the sensors 1/4 inch into thewater. Follow these directions for proper MCG 8165 Probe installation:

1. As guided by **Illustration 4-7**, verify proper assembly of the MCG 8165. Extend the threaded sensors 1/4 inch into the water.

2. Gently feed the probe cable into the monitoring well.

3. Secure guide wire so that it is taut.

4. Secure the probe cable in place.

5. Thread the probe cable through the seal on the junction box.

6. Use a splice kit to attach the probe wires to the MCG 8100 Monitor data highway. Notice that this wiring connection can also be made in the same junction box as the wiring connections for the other probes.

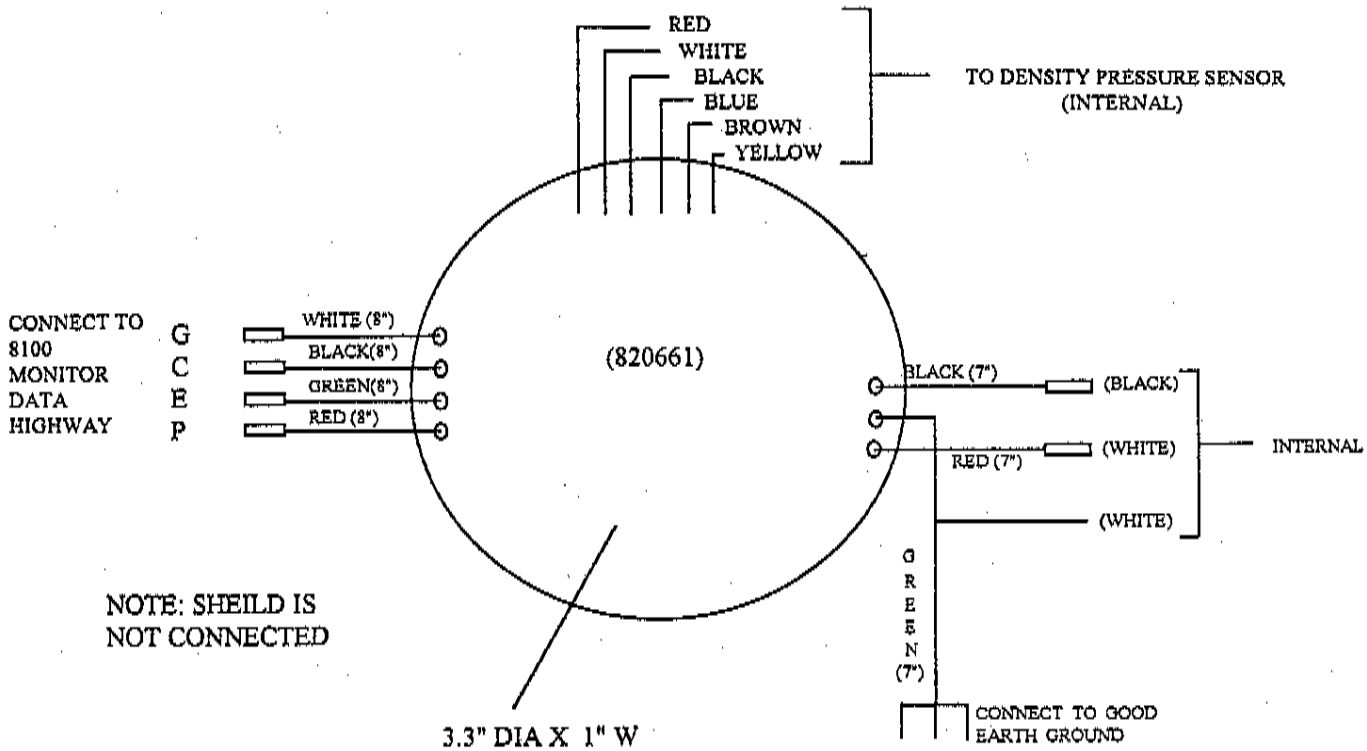


Illustration 4-2
Probe Connections to Hockey Puck

Hockey Puck	Monitor	Hockey Puck	8190/8150A	Hockey Puck	8160	Hockey Puck	8170
Red	Red	Red	Red	Red	Red	Black	Black
Green	Green	Black	Green	Green	Violet	Shield	
Black	Black			Violet	Shield		
White	White			White	White		
		Notes: 1) Use black and red labelled "To 8150" 2) Black and Shield are spliced together				Note: Red, White, Green, from 8170 Not Used	

Table 4-1
Wire Splices

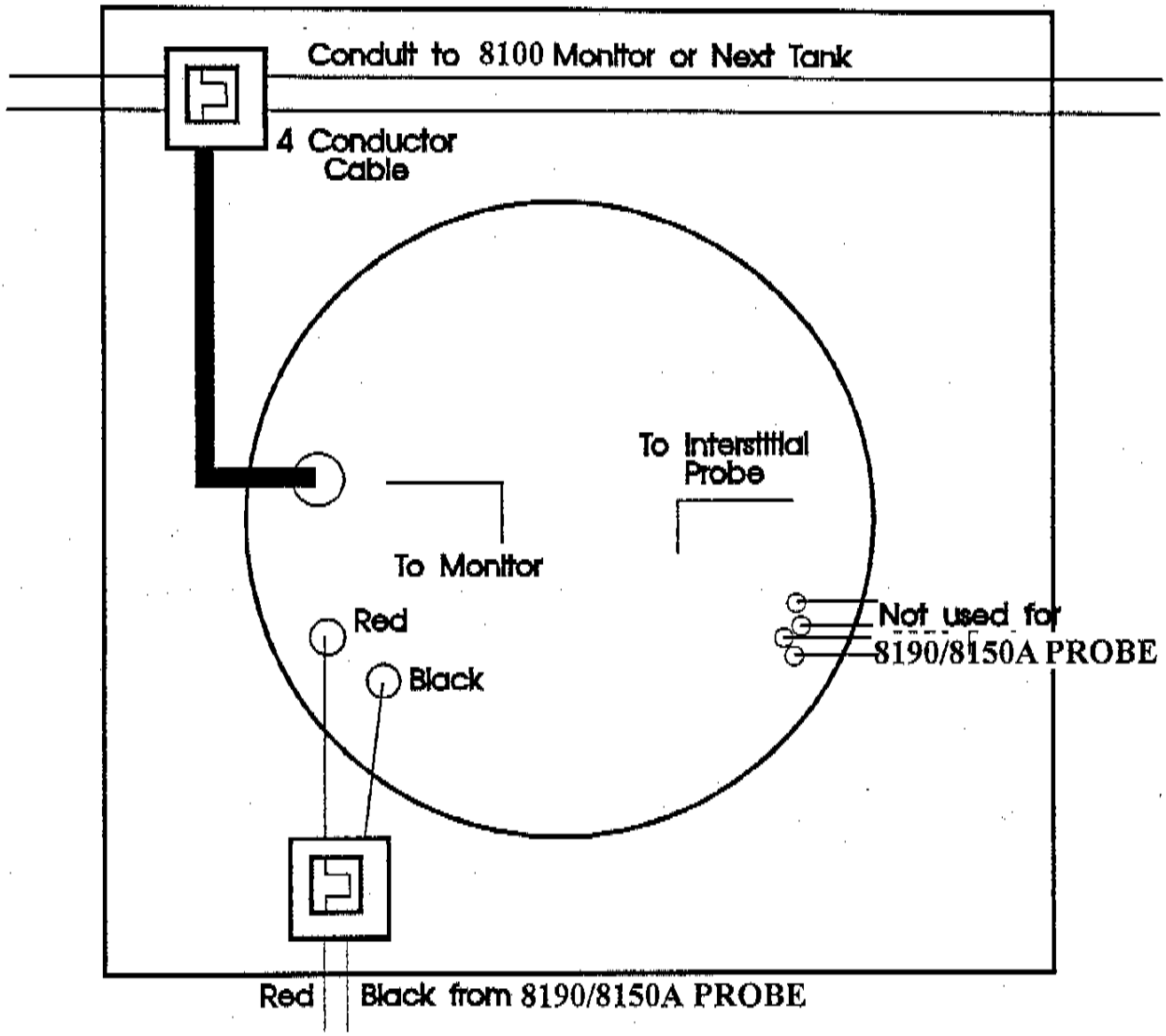


Illustration 4-3
8190/8150A Connections

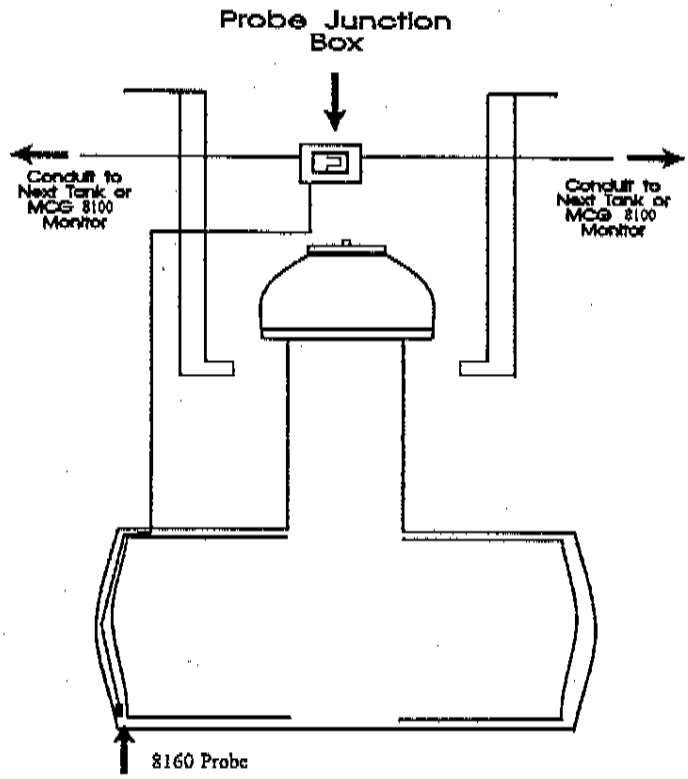


Illustration 4-5
Typical 8160 Installation

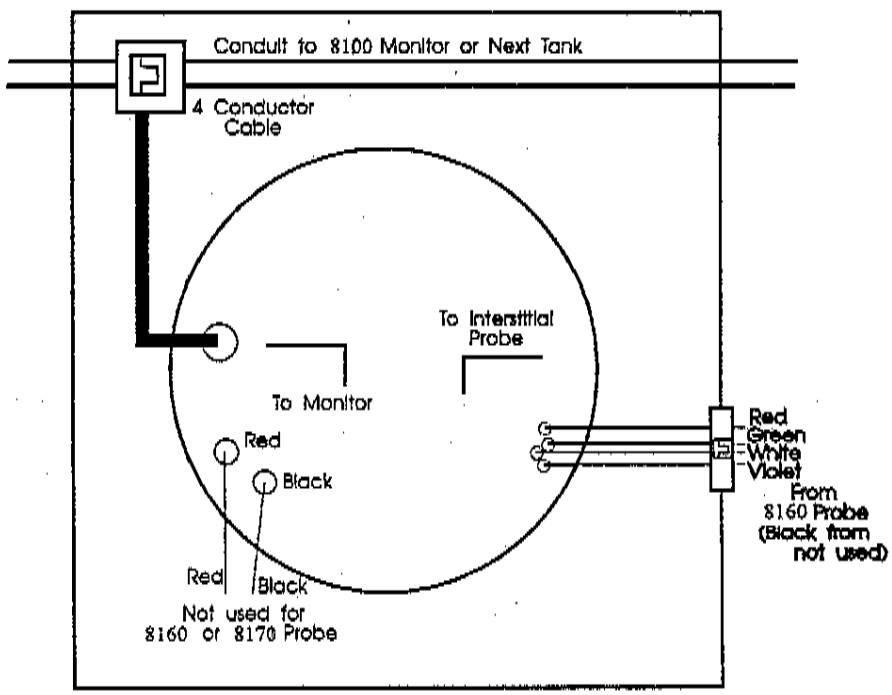


Illustration 4-6
8160 Hockey Puck Connections

4.7 MCG 1170 INSTALLATION

Illustration 4-8 shows the sensor end of the MCG 8170 probe. The sensor element inside the probe cylinder end is a delicate electronic device. When installing the MCG 8170, take care to protect this sensor element from jars or scrapes.

Follow these steps to install the MCG 8170:

1. Gently lower the probe halfway into the vapor well.

Caution
The probe is a sensitive instrument.During installation, handle with careto prevent damage and to insure accurate monitoring.

2. Thread the probe cable through the seal on the junction box.

3. Attach the probe cable wires to the "hockey puck" in terface in the probe junction box. See **Illustration 4-9** for wiring connections

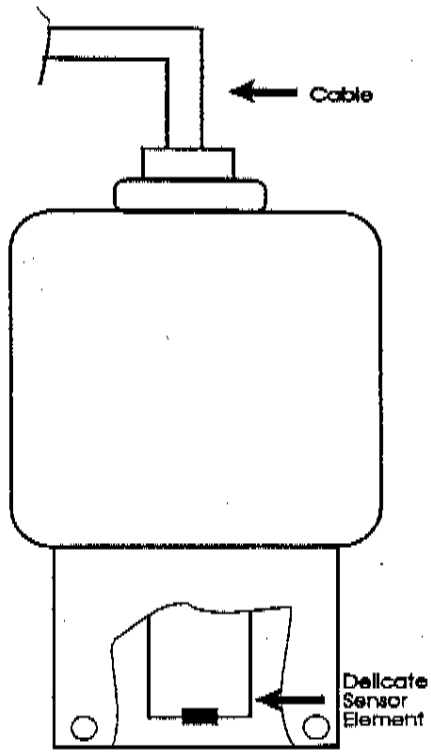


Illustration 4-8
Sensor End of 8170

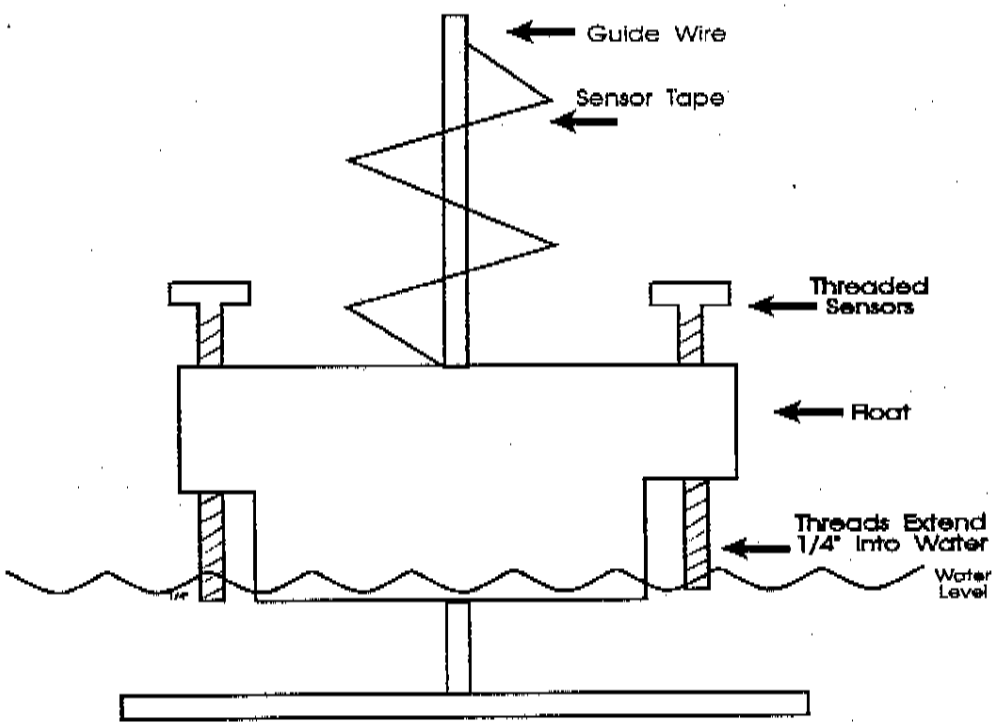


Illustration 4-7
8165 Installation

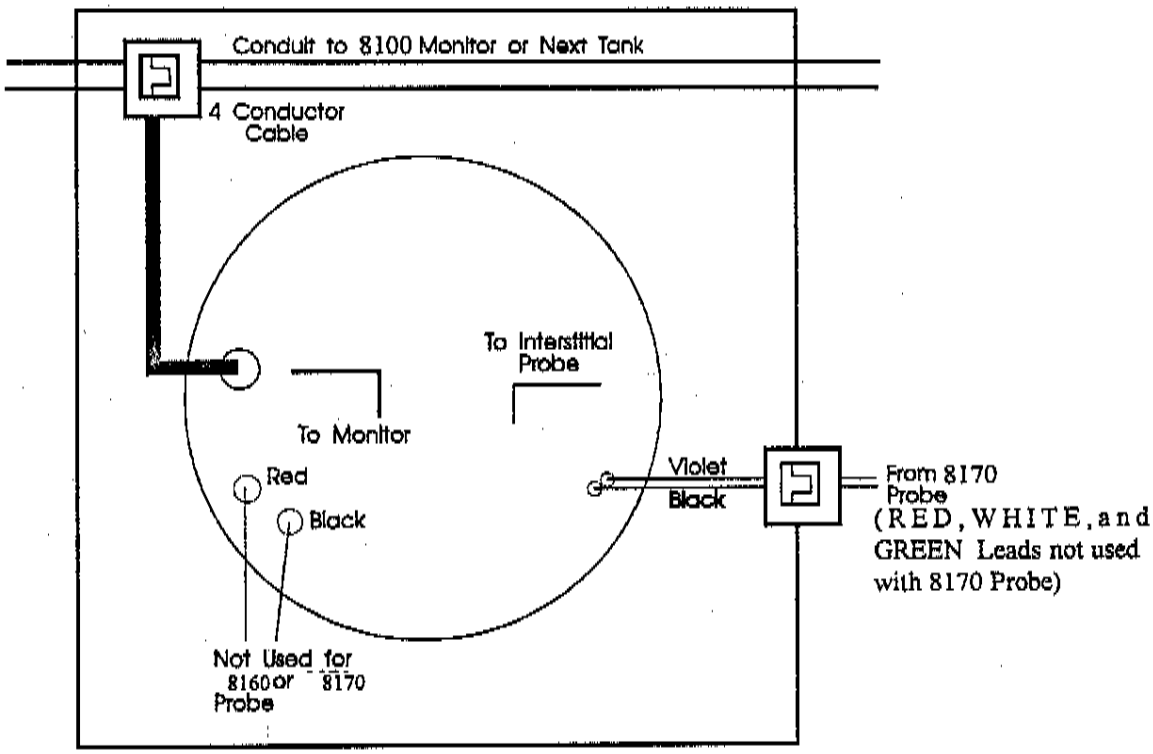


Illustration 4-9
8170 Hockey Puck Connections

4.8 WRAP-UP

Once installation is complete, run through this intrinsic safety checklist to verify proper installation.

Turn off the power to the MCG 8100 Monitor before beginning the intrinsic safety check.

WARNING
Failure to turn off the power can cause death or electrical shock.

4.8.1 EXTERNAL WIRING AND CONDUIT CONNECTIONS

- Check that all probe wires are contained in a dedicated rigid conduit.

- Check that conduits and wiring troughs connecting probes to the monitor are free of any extra, unrelated wires.

- Check that the conduit enters the monitor through its designated preformed conduit knockout.

MAKE SURE SHIELD IS NOT TOUCHING OR HAS ANY CONTACT WITH ANY METAL PARTS, AND THAT IT IS NOT CONNECTED IN ANY WAY.

4.8.2 POWER CONNECTIONS

1. Unlock the monitor.

2. Swing the monitor front panel open.

3. Locate the power supply terminal strip TB1 in the upper left corner of the cabinet.

- Check that a #12 AWG or larger conductor has been connected to each of the following:

  * Barrier ground
  * Bottom left side of the box
  * Earth ground

- Check that the system power is properly wired to a separate, dedicated circuit breaker.

4.8.3 INTERNAL MONITOR WIRING

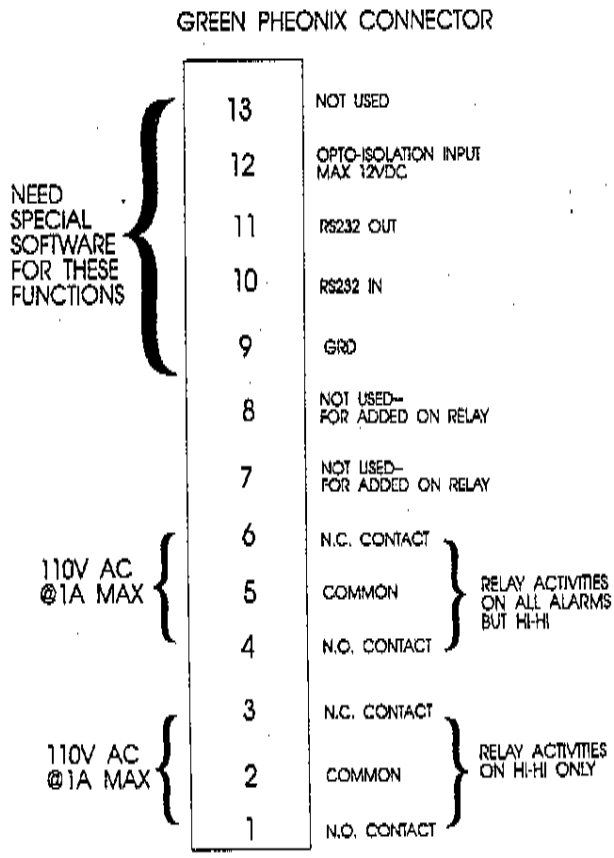
Locate the intrinsically safe barrier cover inside the monitor cabinet by removing the two screws and pulling the barrier cover open.

- Check that all probe connections have been made with color-coded wires.

- Check that wires have been connected in the color order as specified in the probe wiring instructions.

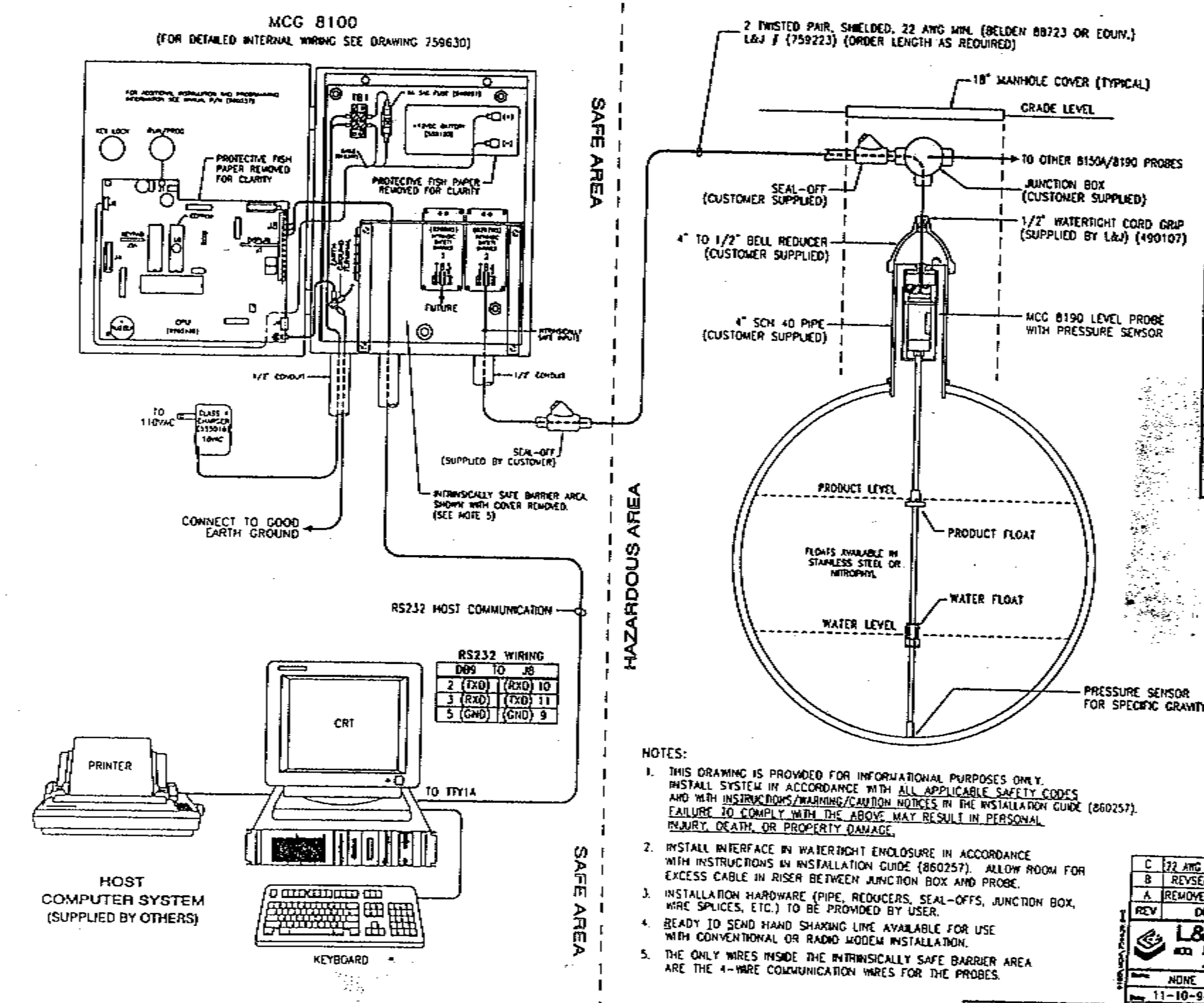
When you complete the checklist, close the barrier cover and the front panel and lock the monitor. For use in system start-up procedures, measure the fuel height, and the fill and probe risers. Also fill out the "Warranty Registration and System Check Form", included here for reference. A clean copy accompanies the MCG 8100.

The MCG 8100 System should now be properly prepared for start-up procedures. If you require additional installation help, contact your L&J Technologies Systems Distributor for assistance.



V. DRAWINGS

759639



TB1	DESCRIPTION
1	16 VAC
2	16 VAC
J8	**DESCRIPTION**
1	RELAY 2 (N.O.)
2	RELAY 2 (COM.)
3	RELAY 2 (N.C.)
4	RELAY 1 (N.O.)
5	RELAY 1 (COM.)
6	RELAY 1 (N.C.)
7	RS232 (TXD)
8	RS232 (RXD)
9	RS232 (GND) (HOST COMM)
10	RS232 (RXD) (HOST COMM)
11	RS232 (TXD) (HOST COMM)
12	DISCRETE INPUT (OPTIONAL)
13	RS232 (RTS) (SEE NOTE 4)
TB3	**DESCRIPTION (BARRIER 1)**
P	POWER
E	ENCODER
C	COMPUTER
G	GROUND
TB4	**DESCRIPTION (BARRIER 2)**
P	POWER (FUTURE)
E	ENCODER (FUTURE)
C	COMPUTER (FUTURE)
G	GROUND (FUTURE)

NOTES:

1. THIS DRAWING IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. INSTALL SYSTEM IN ACCORDANCE WITH ALL APPLICABLE SAFETY CODES AND WITH INSTRUCTIONS/WARNING/CAUTION NOTICES IN THE INSTALLATION GUIDE (860257). FAILURE TO COMPLY WITH THE ABOVE MAY RESULT IN PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE.
2. INSTALL INTERFACE IN WATERTIGHT ENCLOSURE IN ACCORDANCE WITH INSTRUCTIONS IN INSTALLATION GUIDE (860257). ALLOW ROOM FOR EXCESS CABLE IN RISER BETWEEN JUNCTION BOX AND PROBE.
3. INSTALLATION HARDWARE (PIPE, REDUCERS, SEAL-OFFS, JUNCTION BOX, WIRE SPLICES, ETC.) TO BE PROVIDED BY USER.
4. READY TO SEND HAND SHAKING LINE AVAILABLE FOR USE WITH CONVENTIONAL OR RADIO MODEM INSTALLATION.
5. THE ONLY WIRES INSIDE THE INTRINSICALLY SAFE BARRIER AREA ARE THE 4-WIRE COMMUNICATION WIRES FOR THE PROBES.

REV	DESCRIPTION	ECN	BY	DATE	CHK
C	22 AWG WAS 16-18 AWG	-	RBL	4-11-95	
B	REVISED PROBE DETAIL	-	RBL	3-1-95	
A	REMOVED WARNING NOTE	-	RRR	11-11-94	

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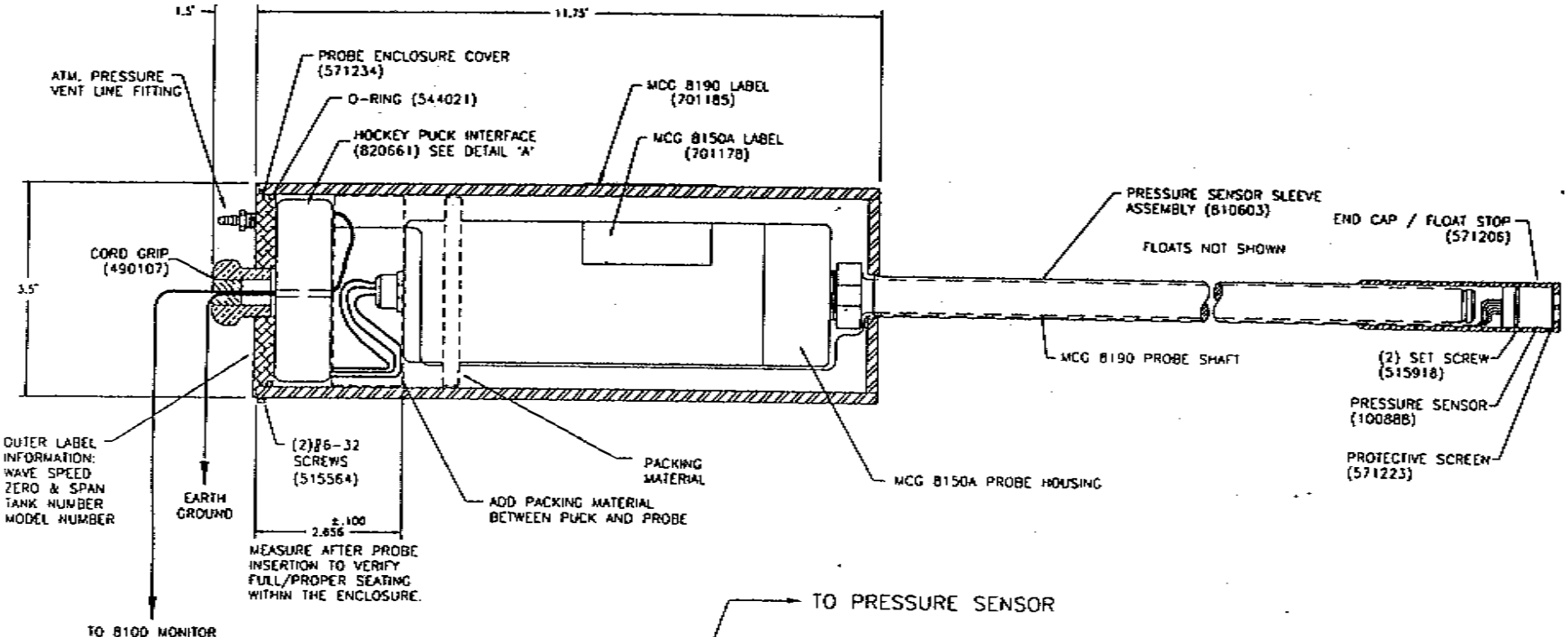
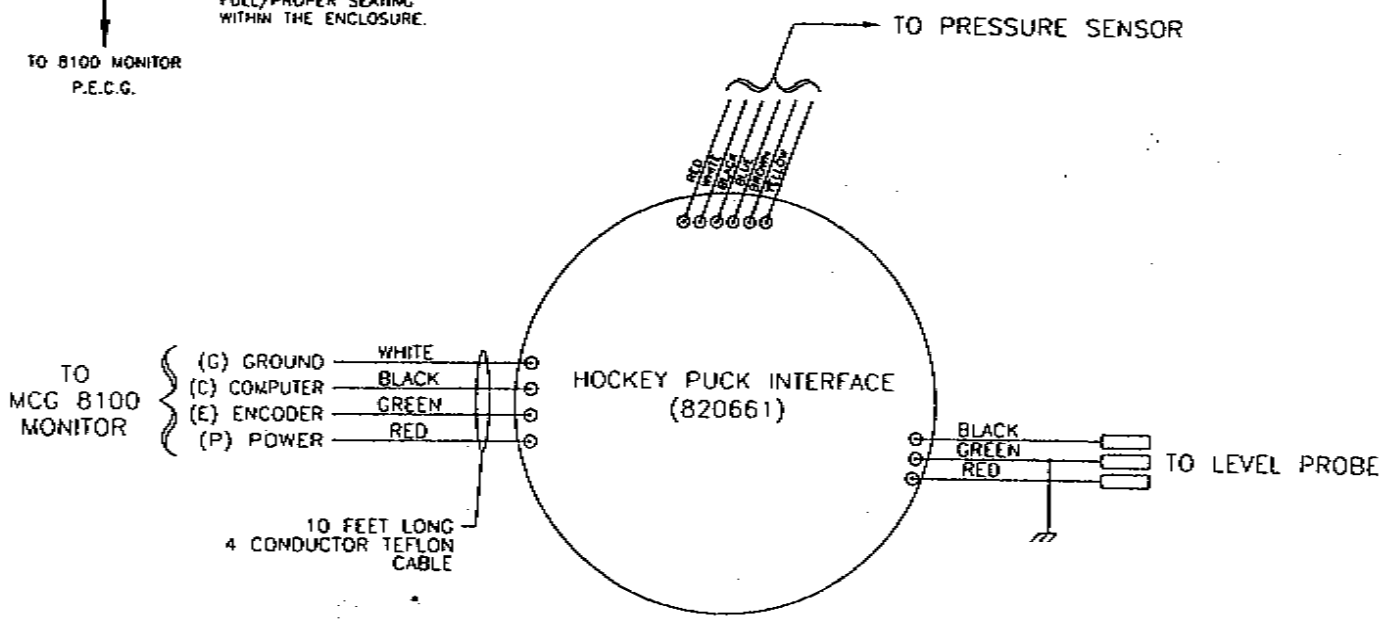
an L&J TECHNOLOGIES Company

Scale: NONE		WIRE	CFL
11-10-94			
FIELD WIRING - MCG 8100 W/2 BARRIERS TO MCG 3800 COMPUTER SYSTEM			
MCG 8100 / MCG 3800		759639	





DETAIL 'A'

REV	DESCRIPTION	MCH	BY	DATE	CH
A	CORRECTED ENCLOSURE COVER P/N FROM:571206 TO:571231		RBL	3/2/	

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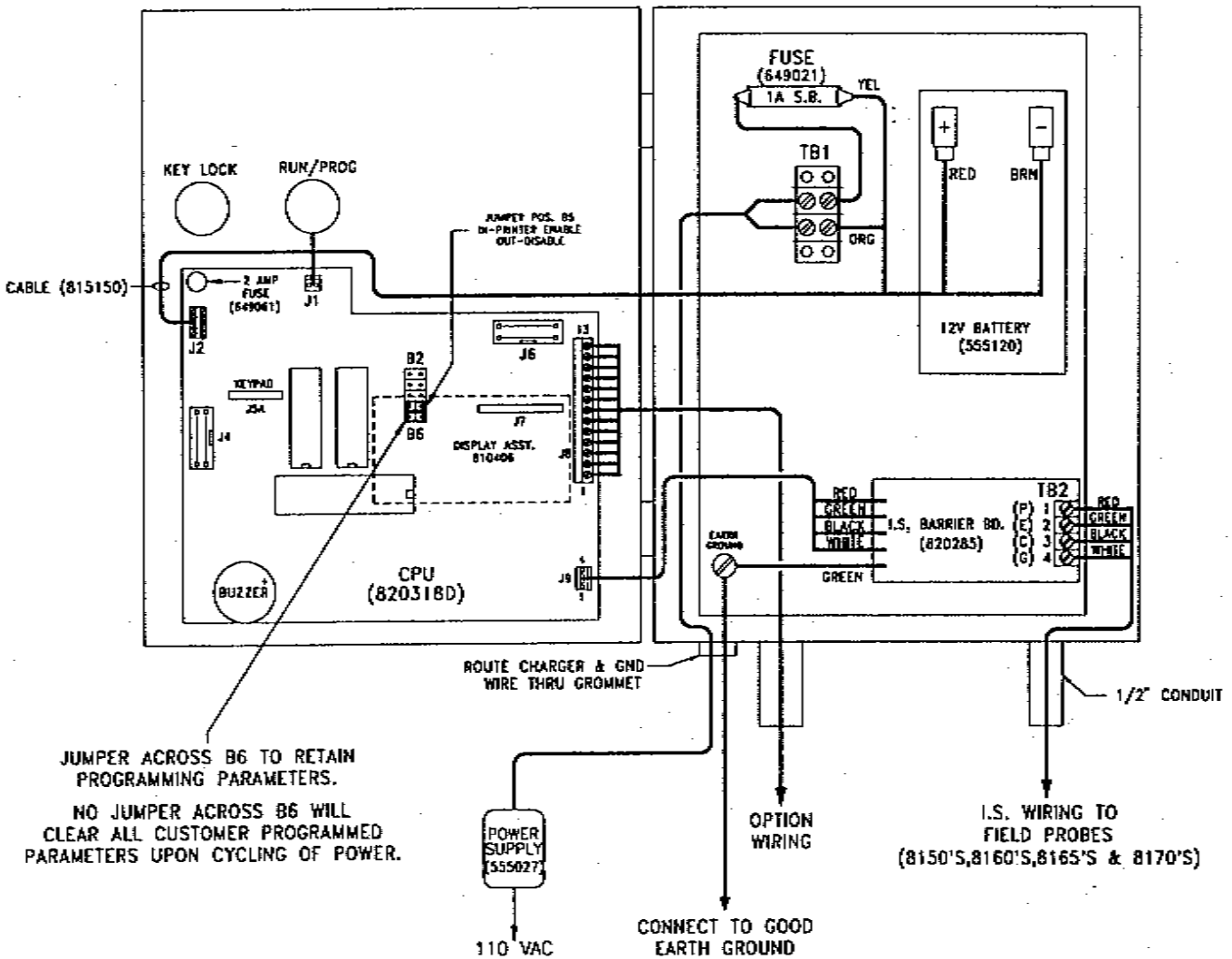
an L&J TECHNOLOGIES Company

NONE		ASSY	
3-2-95			

METHOD OF ASSY. - MCG 8190 LEVEL PROBE WITH PRESSURE SENSOR

MCG 8190 | 810644

759606



TB1	DESCRIPTION	REF
1	16 VAC	
2	16 VAC	
J8	DESCRIPTION	REF
1	RELAY 2 (N.O.)	
2	RELAY 2 (COM.)	
3	RELAY 2 (N.C.)	
4	RELAY 1 (N.O.)	
5	RELAY 1 (COM.)	
6	RELAY 1 (N.C.)	
7	N/C	
8	N/C	
9	RS232 (GND)	
10	RS232 (RXD)	
11	RS232 (TXD)	
12	OPTO INPUT	
13	N/C	
TB2	DESCRIPTION(HAZARDOUS AREA)	REF.
1	POWER-12VDC	RED
2	ENCODER-12VDC NOMINAL	GREEN
3	COMPUTER-26VDC NOMINAL	BLACK
4	GROUND	WHITE
J9	DESCRIPTION (SAFE AREA)	REF.
1	POWER-12VDC	
2	ENCODER-12VDC NOMINAL	
3	COMPUTER-26VDC NOMINAL	
4	GROUND	

REV	DESCRIPTION	MCN	BY	DATE	CHI

L&J ENGINEERING
an L&J TECHNOLOGIES Company
MORTON GROVE, ILLINOIS USA

Scale: NONE	Approved:	Type:	Drawn by: CFL
Date: 6-6-94	Checked:	Designed by:	Revised:

File: Wiring - MCG 8100 w/Single I.S. Barrier/No Printer

Notes: MCG 8100 (NEMA 1 ENCLOSURE)

Drawing Number: 759606

8100\MCN\759606.DWG

MCG 8100 TANK MONITORING SYSTEM

PROGRAMMING MANUAL

TABLE OF CONTENTS

II. MCG 8100 PROGRAMMABLE FUNCTIONS CONT'D. PAGE

I. SYSTEM SETUP OPERATIONS

INTRODUCTION

All functions performed by the MCG 8100 are programmed into the system during the initial setup. This data is programmed through a single eprom, and stored in nonvolatile memory. All MCG 8100 monitor units are shipped with the eprom secured and the internal power plug disengaged.

PRE-PROGRAMMING PREPARATION

Before initial programming, some steps must be taken to ensure proper data transfer.

1. Power up the monitor by plugging the internal power cord to the CPU board. (See drawing 759606 or 759639)

2. Check the display on the front of the monitor.

   A. If it reads normally, that is, it displays the tank number and name, or the date, then the system is ready to be programmed.

   B. If the display reads something out of the ordinary, such as rows of symbols or scrambled digits and letters, then do the following:

      1. Remove Jumper B6.

      2. Disengage the internal power plug from the CPU board, then plug it back in.

      3. Re-install jumper B6.

      4. Check the display. It should now read normally.

YOU ARE NOW READY to PROGRAM the MCG 8100.

*NOTE #1 - Be sure that jumper B6 is in place when programming begins. If it is removed after any data has been entered, you may lose that information.

*NOTE #2 - The functions explained on the following pages can be programmed in any order. The number of tanks and probes should be programmed first. Page 3 is a complete list of the programmable functions and their function numbers.

*NOTE #3 - When entering into one of the functions, for programming, there is always a 60 second time limit to begin entering values. If nothing is entered within that 1 minute period, you will automatically be released from the function. You will not lose any of the data you've already entered, but you will simply have to recall the function.

INITIAL SYSTEM PROGRAMMING

The following is an initial programming procedure for start-up systems. Programming is broken out into two parts, one for 8190A/8150A tank level probes and the other for 81xx interstitial probes.

After programming:

1. Run the #125 function to get a print out of all the information you just programmed in.

NOTES:

If your system has no 8190A/8150A tank level proves use #123 function and set the number of tanks to 0.

If your system has no 81xx interstitial probes use #190 function and set the number of probes to 0.

INITIAL SYSTEM PROGRAMMING FOR 8190A/8150A TANK PROBES

The following is an initial programming procedure for start-up systems.

Before you start you will need to know the following information:

1. The length's and level correction factor of all the 8190A/8150A probes.

2. The product API gravity for each tank.

3. Decide if you want to use a Strapping table or Equation for each tank, if you use a strapping table you will need it, if you are using a math equation you will need the tanks inside diameter and length. In addition you will need to know the maximum volume of the tank.

4. The Alarm points for HI-HI, HI, Low product and HI water. If you do not know them you can enter them later.

1. Set date #101 and time #102.

2. Enter Site name with #118 and use #119 to enter the site location.

3. Set number of 8190A/8150A tank probes #123.

REPEAT steps 4 through 8 for each tank.

4. If 8190A/8150A probe has non-standard address use #131.

5. Now you need to enter select strapping tables and or equations #122.
For entry of strapping tables use #120.
For entry of tank dimension use #116.

6. Now enter tank alarm points #103,#104, #105, #135.

7. Enter Probe and level correction factor using #106. The level correction factor is stamped on each probe. Enter Maximum Volume with the #124 for theULLAGE report line of tank report.

8. Enter product API gravity with #115 and use #111 to enter product code name, if no product code name listed matches the one you need in the 111 function, use the #117 to enter your own.

9. If you do not want automatic night leak testing use the #128 to disable.

10. If you do not want automatic delivery reports use the #132 to disable.

11. If you want automatic inventory reports use #112 to enable them.

NOTES:

If your system has no 8190A/8150A tank level probes use #123 and set the number of tanks to 0.
= function.
REPEAT steps 4 through 8 for each tank.

INITIAL SYSTEM PROGRAMMING FOR 81xx INTERSTITIAL PROBES

The following is an initial programming procedure for start-up systems. Before you start you will need to know the following information:

1. The total number of interstitial probes.
2. The types of interstitial probes.
3. The address of each interstitial probe.
4. If you have 81xxB vapor PPM probes you will need the alarm PPM values.

1. Set the number of Interstitial probes with the #190.
REPEAT steps 2 through 5 for each 81xx Intersti tial probe.
2. Use the #192 to set etch 81xx probe address.
3. Select 81xx type and enable with the #191. "you must enter type before enabling."
4. Enter 81xx probe name if you do not like the default names.
5. If you have 81xxB probes, and want automatic reports use #198.

NOTES:

If your system has no 81xx interstitial probes use #190 function and set the number of probes to 0.
= function.

81xx refers to 8160,8165, 8170, 8185, 8180B, 8185B probes
81xxB refers to 8165B, 8170B, 8180B probes.
REPEAT steps 2 through 5 for each 81xx Interstitial probe.

II. MCG 8100 PROGRAMMABLE FUNCTIONS

FUNCTION # FUNCTION

101 Setting the Date
102 Setting the Time
103 High Product Alarm
104 Low Product Alarm
105 High Water Alarm
106 Level Correction Factor
107 Set probe length
109 Product Level Calibration
110 Water Level Calibration
111 Product Code Assignment
112 Automatic Print Time Setup
113 Delivery Report Parameters
114 Night Movement Delay Setup
115 Product Gravity Assignment
116 Entering a Tank Dimension
117 Changing Product Code Names
118 Customer Name Assignment
119 Customer Location Assignment
120 Entering a Strapping Table
122 Select Strapping Table/Equation
123 Entering Amount of Tanks
124 Maximum Tank Volume
125 Printout of All Parameters
126 Print Alarm History
127 Clear Alarm History
128 Enable/Disable Leakage Test Status
129 Manual Leakage Test
130 Tank Tilt Correction
131 Change Tank Scan Address
132 Enable/Disable Delivery Report
133 Set Start & Stop Times For Auto Leak Test
134 Abort Leak Test
135 Set The HI HI Product/Overfill Alarm
136 Set Level Probe Type
190 Entering Number of Probes
191 Entering Probe Type & Enable,Disable
192 Change Probe Address
193 Change Probe Name
194 Set Pressure Span
195 Set Zero Pressure Counts

---------- SYSTEM ----------
101 Setting the Date
102 Setting the Time
114 Night Movement Delay Setup
118 Customer Name Assignment
119 Customer Location Assignment
123 Entering Amount of Tanks
190 Entering Amount of Probes

REPORTS
112 Automatic Print Time Setup
125 Printout Of All Parameters
126 Print Alarm History
127 Clear Alarm History
132 Enable/Disable Delivery Report

---------- INTERSTITIAL PROBES ----------
CONFIGURATION
191 Entering Probe Type & Enable, Disable
192 Change Probe Address
193 Change Probe Name
194 Set Pressure Span
195 Set Zero Pressure Counts

---------- 8150 LEVEL PROBES ----------
ALARMS
135 Set The HI HI Product/Overfill Alarm
103 High Product Alarm
104 Low Product Alarm
105 High Water Alarm

CONFIGURATION
106 Level Correction Factor
107 Set probe length
109 Product Level Calibration
110 Water Level Calibration
111 Product Code Assignment
113 Delivery Report Parameters
115 Product Gravity Assignment
116 Entering A Tank Equation
117 Changing Product Code Names
120 Entering a Strapping Table
130 Tank Tilt Correction
131 Change Tank Scan Address
128 Enable/Disable Leakage Test Status
129 Manual Leakage Test
133 Set Start & Stop Times For Auto Leak Test
134 Abort Leak Test

SETTING THE DATE

FUNCTION 101

1. Press digits 101, then the "FUNC" key. The display shows the date set entry prompt as follows:

SET CURRENT DATE
ENTER-> MM,DD,YY

2. Enter the proper digits for the month, day, and year. (NOTE: there are two entries for each)

EXAMPLE:

MAY 1, 1995 is entered
05,01,95

3. When the correct date is displayed, press the "ENTR" key to enter the date, and exit the function.

SETTING THE TIME

FUNCTION 102

1. Press digits 102, then the "FUNC" key. The display shows the time set entry prompt as follows:

SET CURRENT TIME
ENTER-> HH,MM,SS

2. Enter the proper digits for the hour, minute, and second (NOTE: time is displayed using a 24 hour clock).

EXAMPLE:

2:05 PM is entered
14:05:00

3. When the proper time is displayed, press the "ENTR" key to enter the time and exit the function.

SETTING THE HIGH PRODUCT ALARM

FUNCTION 103

1. Press the digit key for the number of the tank which you will be assigning, following by the "TANK" key.

2. Press digits 103, then the "FUNC" key. The display shows the tank number, the current value for the high level product alarm, and the entry prompt as follows:

1-HI ALARM (PRD)
<000.00> III.HH

3. Using the digit keys, enter the value (in inches) at which, if the tank level reaches, the high product alarm will be triggered.

4. When the proper value is displayed, press the "ENTR" key to store the valve and exit the function.

SETTING THE ALARM FOR LOW PRODUCT

FUNCTION 104

1. Press the digit key for the number of the tank which you will be assigning, followed by the "TANK" key.

2. Press digits 104, then the "FUNC" key. The display shows the tank number, the current value for the low-level product alarm and the entry prompt as follows:

1-LO-ALARM (PRD)
<000.00> III HH

3. Using the digit keys, enter the value (in inches) at which the low alarm will be triggered.

4. When the proper value is displayed, press the "ENTR" key to store the value and exit the function.

* SUGGESTED ENTRY FOR LOW PRODUCT ALARM: NO LESS THAN AN AVERAGE WEEKS WORTH OF VOLUME.

SETTING THE HIGH WATER ALARM

FUNCTION 105

1. Press the digit key for the number of the tank which you will be assigning, followed by the "TANK" key.

2. Press digits 105, then the "FUNC" key. The display shows the tank number, the current value for the

high water level alarm, and the entry prompt as follows:

1-HI ALARM (WAT)
<000.00> III.HH

3. Using the digit keys, enter the value (in inches) at which the high water alarm will be triggered.

4. When the proper value is displayed, press the "ENTR" key to store the value and exit the function.

* SUGGESTED ENTRY FOR HIGH WATER ALARM: JUST BELOW THE PRODUCT SUCTION LINE.

SETTING THE LEVEL CORRECTION FACTOR

FUNCTION 106

The purpose of the 106 Function is to program the level correction factor for each level probe. Each level probe differs slightly in electrical characteristics. The MCG-8100 must know the correction factor for each tank's level probe.

1 LEV. FACTOR
9.0189 > #.####

The display shows the current tank number in the upper left hand corner, current correction factor in the lower left hand corner and in the lower right hand corner is where you will enter the new correction factor.

1. Press the digits 106, then the "FUNC" key.

2. Press the "TANK" key to select the tank for which you wish to change the level correction factor.

3. When the proper TANK is displayed, use the digit keys 0 - 9 to enter the new level correction factor for the level probe attached to the current displayed tank. Then press the "ENTR" key.

4. Repeat steps 2 and 3 as needed or press the "ACK" key to exit.

PROBE LENGTH & RTD LOCATIONS

FUNCTION 107

FOR TANK #1 ONLY

The purpose of the 107 function is to set the 8190A/8150A level probe length for any probe over 15 feet long. Any Probe over 15 feet must be installed as TANK #1 on the MCG 8100 monitor. Failure to do so will give erronious Level & Temperature readings.

1. Press the digits 107, then "FUNC" key.

2. Using the digit keys enter the length of the probe in Feet-inches-16ths.

3. When the proper value is displayed press the "ENTR" key to store the value.

4. Press the "ACK" to exit this function.

*NOTE : WHEN YOU ENTER THE "PROBE LENGTH" THE 8100 WILL SET THE RTD LOCATIONS TO FACTORY CALCULATED DEFAULT VALUES.

FOR TANKS 2 THRU 10

The purpose of the 107 function is to set the 8150 level probes 5 RTD locations and max length of the probe. The RTD location is the distance that each RTD is from the bottom of the probe. The RTD's are used for the average product temperature, the 8100 will average the temperature RTD that are under the product level.

1. Press the digits 107, then "FUNC" key.

2. Press the "TANK" key to select the tank for which you wish to change.

3. Press the "ALPHA UP" or "ALPHA DOWN" key to select the RTD for which you wish to change.

4. Using the digit keys enter the value for the RTD you wish to change.

5. When the proper value is displayed press the "ENTR" key to store the value.

6. Press the "ACK" to exit this function.

PRODUCT CODE ASSIGNMENT

FUNCTION 111

1. Press the digit key for the number of the tank which you will be assigning a code to, followed by the "TANK" key.

2. Press digits 111 then the "FUNC" key. The display shows the tank number, the current product code assignment, and the entry prompt as follows:

    1-PRODUCT CODE
    (01 REGULAR) ##

3.a Using the "ALPHA UP" or "ALPHA DOWN" keys select one of the product codes for the tank number displayed. Eight product code names are pre-programmed into the system and two more are left blank. They are:

<01 REGULAR>	<05 KEROSEN>	<09 >
<02 NO LEAD>	<06 PREMIUM>	<10 >
<03 PREM NL>	<07 SOLVENT>	
<04 DIESEL>	<08 ALCOHOL>	

3.b When the proper code is found, press the "ENTR" key to store the code and exit the function or enter the product code number then press the "ENTR" key.

4. New product names can be assigned using function 117.

AUTOMATIC PRINT TIME SET-UP

FUNCTION 112

1. Press digits 112, then the "FUNC" key. The display shows the print time number, the current print time, and the print time entry prompts as follows:

    PRINT TIME <T>
    (24:00) -> HH.MM

<T> represents the # of the print time. The system allows for up to 6 automatic print times to be stored.

2. To store a print time, first use "ALPHA UP" or "ALPHA DOWN" key to select the number of the print time you want to enter.

3. Then use the digit keys to enter the automatic print time.(NOTE: The time is always set using a 24 hour clock) When the time displayed is correct, press the "ENTR" key

EXAMPLE:
PRINT TIME <1>
(11:30: -> HH.MM

This means that your first automatic report will be generated at 11:30.

4. To set the next time that a report will be generated, press the "ALPHA UP" key to the next number, and insert the next time that you would like an automatic report. (NOTE: The time is always set using a 24 hour clock)

5. To disable the auto-print function, meaning you don't want any reports generated automatically, enter the time of 24:00 for all the point times.

6. If you want less than 6 automatic reports, simply enter the times you'd like reports, and fill in 24:00 for the rest of the times.

7. Press the "CUR LEFT" key to exit this function.

AUTOMATIC DELIVERY REPORT PARAMETERS

FUNCTION 113

1. Press digits 113, then the "FUNC" key. The display shows the delivery start entry prompt for _time_ as follows:

    DEL. START TIME *SUGGESTED ENTRY:
    (10) #### SEC 10 TO 20 SECONDS

2. Using the digit keys, enter the amount of time (in seconds) after a level change has occurred, for a delivery report to start.

3. When the proper amount of time has been selected, press the "ENTR" key to store this time and move onto the next parameter.

4. The display should now show the delivery start entry prompt for movement, as follows:

    DEL. START MOVE *SUGGESTED ENTRY:
    (.250) ### IN .25 TO .50 INCHES

5. Using the digit keys, enter the minimum amount of upward movement in the level of the tank, in order to start an automatic delivery report.

6. When the desired amount of movement (in inches) has been selected, press the "ENTR" key to stop this value and move onto the next parameter.

7. The display should now show the delivery stop entry prompt for time as follows:

DEL. STOP TIME *SUGGESTED ENTRY:
(90) #### SEC 60 TO 160 SECONDS

8. Using the digit keys, entr the amount of time (in seconds) at which there is no longer tank movement, signifying the end of the delivery.

9. When the proper time has been selected, press the "ENTR" key to store this number and exit this function.

NIGHT MOVEMENT DELAY SET-UP

FUNCTION 114

1. Press digits 114, then the "FUNC" key. The display shows the current night movement delay, and the night time delay entry prompt as follows:

NIGHT TIME DELAY *SUGGESTED ENTRY:
(00:01) -> HH.MM :10 TO 30 MINUTES

NOTE: The time represents the amount of time to be delayed after the first occurrence of tank movement until the next detection of tank movement.

2. Using the digit keys enter the proper amount of time between tank movement detections and press the "ENTR" key to store the time and exit the function.

PRODUCT GRAVITY ASSIGNMENT

FUNCTION 115

1. Press the digits 115, then the "FUNC" key. The display shows the tank number, current product API gravity and the entry prompts as follows:

TANK (3) 65.4
GRAVITY > ##.#

2. Press the "TANK" key to select the tank which you will be assigning the gravity to.

3. When the proper tank is chosen (displayed on the readout) use the digit keys to enter the proper value.

4. When the proper value is displayed, press the "ENTR" key, and the new value will be displayed.

5. To move to the next tank, press the "TANK" key and repeat steps 3 and 4.

6. When completed, press the "CUR LEFT" key to exit the function.

PRODUCT GRAVITY

Below is a list of product codes along with general API Gravities for these products.

Diesel	47
Lead Free	65
Leaded	65
Premium Leaded	65
Premium Unleaded	65
Regular Leaded	65
Regular Unleaded	65
Toluene	47
Jet Fuel (Jet "A" JP4. JP5)	75
Augas	75
#2 Heating Oil	47
Kerosene	47
Turbine Oil	47
Xylene	47

TANK DIMENSION ASSIGNMENT TO ENTER AN EQUATION - (When strapping tables are unavailable, levels and volumes for a tank can be found simply by entering the tanks equation diameter and length). Max value is 6553.5

FUNCTION 116

PART 1 - Press digits 122 then "FUNC" key.

1. Choose tank number by pressing "TANK" key.

2. Press the "FUNC" key until "equation" is displayed.

3. Choose number of equation by pressing the "ALPHA UP" key until the desired number is displayed.

NOTE: Equation (1) is for horizontal tanks and requires both diameter and length. Equation (2) is for cylindrical and vertical tanks. This requires both diameter and the length to be the same.

4. Once all of the correct information is selected, press the "ENTR" key to exit this function.

PART II - Press digits 116 then the "FUNC" key.

1. Choose tank number by pressing the "TANK" key.

2. Press the "FUNC" key until the word "diameter" is displayed.
3. Then insert the diameter value in inches and press "ENTR" key.

4. Again press the "FUNC" key until "length" is dis played.

5. Enter the value in inches and press the "ENTR" key.

6. Press "CUR LEFT" key to exit this function.

CHANGING PRODUCT CODE NAMES - (This function is used when you want to rename one of the standard product code names.)

FUNCTION 117

1. Press digits 117, then the "FUNC" key. Display shows the product code number, product name and blank entry prompt as follows:

(1) REGULAR
NAME —> _____

2. To enter new product names, select the product code you will be replacing by pressing the "TANK" key until it appears.

3. To enter a new name, press the "ALPHA UP" or "ALPHA DOWN" key until the desired symbol appears.

4. Enter the symbol by pressing the "CUR RIGHT" key, moving the cursor one space to the right.

5. Repeat step 3 and 4 until the entire name is displayed. Then, and only then, press the "ENTR" key to store the entire name.

6. To move on to the next code to be changed, press the "TANK" key, which moves to the next product number, and the same procedure can be done until all the new product codes desired are entered.

7. To exit this function, press the "ACK" key.

CUSTOMER NAME ASSIGNMENT

FUNCTION 118

1. Press digits 118, then the "FUNC" key. The display shows the current customer name, character to be selected, and the cursor, as follows:

L & J ENGINEERING (this will read on one
INC (L) line on printout)

NOTE: There are 21 spaces available for the customer name, and 59 characters to choose from. They are as follows: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?

2. To assign the name, press the "ALPHA UP" or ALPHA DOWN" keys until the desired symbol appears.

3. Press the "ENTR" key to store that letter, and the cursor automatically moves to the next space.

4. Repeat step 2 and 3 until the entire name is complete.

5. When the entire name is entered, press the "ACK" key. This will store the name and exit the function.

CUSTOMER LOCATION ASSIGNMENT

FUNCTION 119

1. Press digits 119, then the "FUNC" key. The display shows the current customer location, character to be selected, and the cursor, as follows:

6511 Oakton St. (this will read on one line on printout)

NOTE: There are 21 spaces available for the customer location, and 59 characters to choose from. They are as follows: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?

2. To assign the location, press the "ALPHA UP" or ALPHA DOWN" keys until the desired symbol appears.

3. Press the "ENTR" key to store that letter, and the cursor automatically moves to the next space.

4. Repeat step 2 and 3 until the entire location is complete.

5. When the location is entered, press the "ACK" key. This will store the name and exit the function.

PROCEDURE TO ENTER A TABLE

FUNCTION 122

Note: Must be performed in sequence.

PART I - Press digits 122 then the "FUNC" key.

1. Choose the number of the tank you will be program ming by pressing the "TANK" key.

2. Press the "FUNC" key until the word "table" is displayed.

3. Choose a table number by pressing the "ALPHA UP" or "ALPHA DOWN" keys. (Up to 8 strapping tables can be stored)

4. Once all of the correct information is selected, press the "ENTR" key to exit this function and move on to the next part.

FUNCTION 120

PART II - Press digits 120 then the "FUNC" key.

1. Select table by using the "ALPHA UP" or "ALPHA DOWN" keys.Press "ENTR" when correct table number is displayed.

2. Enter the increment in eighths, at which each value will be entered. For example, 96 "ENTR", will select the table for 1 foot increments. After the proper increment is entered, hit the "FUNC" key.

3. Select point to start entering table values by using the "ALPHA UP" or "ALPHA DOWN" keys. Press the "ENTR" key when the start point is reached.

4. Enter the volume in gallons for the first point at press the "ENTR" key Use the "ALPHA UP" or "ALPHA DOWN" keys to select different levels in the table to enter new volumes or check previous entries.

5. Press "ACK" key when all entries have been completed. key and repeat step 4.

PROCEDURE TO ENTER AMOUNT OF TANKS

FUNCTION 123

1. Press digit keys 123, then the "FUNC" key. The display shows the current number of tanks, and the entry prompt for the new amount of tanks, as follows:

NUMBER OF TNK 8
ENTER NEW -> ###

2. Enter the amount of tanks by pressing the corresponding digit key followed by the "ENTR" key.

EXAMPLE: If 7 tanks are to be monitored, simply press the "7" digit key, followed by the "ENTR" key. The display will now read the new amount entered.

3. If the amount displayed is correct, press the "ACK" key to acknowledge the information and exit the function. If a change is desired, simply enter the new amount via the digit keys, followed by the "ENTR" key. Then press the "ACK" key to exit the function.

SET MAXIMUM TANK VOLUME FOR ULLAGE

FUNCTION 124

The purpose of the 124 function is to program the maximum tank volume for ULLAGE line of tank report.

```
TANK ( 1) 12345
VOLUME ---> #####
```

1. Press the digits 124, then the "FUNC" key.

2. Press the "TANK" key to select the tank for which you wish to change the maximum volume.

3. When the proper TANK is displayed, use the digit keys 0 - 20 to enter the new maximum volume. Then press the "ENTR" key.

4. Repeat steps 2 and 3 as needed or press the "ACK" key to exit.

PRINTOUT OF ALL CUSTOMER ENTERED PARAMETERS

FUNCTION 125

1. Press digits 125, then the "FUNC" key. The machine will printout the parameters which have been entered by the programmer. This is to ensure that the machine has accepted all parameters and that they are correct.

PRINT ALARM HISTORY AND CLEAR HISTORY

FUNCTION 126

These reports are available so when an alarm sounds the monitor will store it in its memory. The customer can then recall the alarms at any time.

By punching in two (2) print, an Alarm Summary Report will be printed out showing you the last 33 alarms that occurred. The memory will store up to thirty-three(33) alarms.

To clear the Alarm Summary Report, put the monitor in the programming mode and punch in 127 function.This will give you one last Alarm Summary and then clear the monitor.

CLEAR HISTORY

FUNCTION 127

Clear Alarm Summary Report. This will give you one last Alarm Summary and then clear the monitor.

ENABLE/DISABLE TANK LEAKAGE TEST STATUS FOR AUTOMATIC LEAKAGE TEST WHEN IN NIGHT MONITORING MODE

FUNCTION 128

1. Press the digits 128, then the "FUNC" key. The display shows the Tank number, current status. The entry prompts as follows:

```
TANK( 5) DISABLE
ENTER-> #
```

2. Press the "TANK" key to select the tank for which you wish to change the current state of Leak test.

3. When the proper "TANK" is displayed, use the digit keys "1" to ENABLE or "0" to DISABLE followed by the "ENTR" key.

4. Repeat steps 2 and 3 as needed or press "CUR_LEFT" to exit.

**** WARNING DO NOT CHANGE THE STATUS OF A TANK IF THE TANK IS CURRENTLY IN MANUAL LEAK TEST MODE "FUNCTION 129"**

MANUAL TANK LEAKAGE TEST

FUNCTION 129

1. Press the digit key for the tank number you wish to perform leakage test on, followed by pressing the "TANK" key.

2. Press digits 129 then the "FUNC" key to start test, the printer will print the following:

```
Leak Test in Progress
on TANK #5
06/07/89    00:00:00
```

3. After a period of time press the digits 129 then the "FUNC" key, to Complete test, the printer will print a Leakage Summary report followed by:

Leak Test Complete
on TANK #5
06/07/89 07:30:00

TANK TILT CORRECTION FACTORS

FUNCTION 130

In this programming function the following keys have special usage:

"TANK" - Selects next tank.
"FUNC" - Selects from L1, L2, L3.

"ENTR" - Reads current User Keyed value for L1, L2, L3. with L3 the "ENTR" has two possible functions,

1. Read in current user enter value.
2. If no value is entered, this will calculate tilt correction factor.

** you must force the program to recalculate tilt correction factor any time you change the values of L1 or L2.

L1 = Horizontal tank tilt angle from level in degrees. This angle is measured from probe end. If probe is on high end of tank subtract this angle from 180, etc. if tank angle = 4.58 degrees if probe on high end of tank then 180 - 4.58 = 175.42 the value to be entered is 175.42. if probe on low end of tank then the value to be entered is 4.58.

L2 = Distance 8190A/8150AProbe is from center of tank in inches.

1. On horizontal tanks this is from the middle of the tank lengthwise to the 8190A/8150A probe.
2. On vertical tank this is from the center of the tank to the 8190SA/8150A probe.

L3 = Tilt correction factor. If this number enter is 0.00 then tank tilt correction is disabled. Otherwise number enter is added or subtracted to the level then 8100 calculates the tank volume.

** The value of L3 is used for volume calculates only, and has no effect on the display levels.

** To enter negative numbers subtract the correction number from 655.36. If you wish a correction factor is -8.01 then subtract 655.36 - 8.01 = 647.35 and enter the number 647.35 from the keyboard press the "ENTR" key and the displayed value is -8.01.

** Just remember that correction factor is used to estimate the tank level at the center of the tank So if the probe is on the low end of the tank we want to add to the level and to subtract if the probe is on the high end.

** If you know the tank tilt correction factor you need not enter values for L1 and L2, but its best to set them to 0.

The values for L1, L2, or L3 must be entered even if tank uses strapping table to calculate tank volume.

1. Press the digits 130, then the "FUNC" key.
2. Select the tank at correction factors will be entered for by pressing the "TANK" key, until the desired tank is displayed.
3. Enter the value for L1 or L2 or L3 then press "ENTR" key for your entered values to be read.
4. Press the "FUNC" key to switch between L1, L2, L3.
5. To exit function press the "ACK" key.

CHANGE TANK SCAN ADDRESS

FUNCTION 131

1. Press the digits 131, then the "FUNC" key. The display shows the current address of tank probe, and the entry prompt for the new address of tank probe, as follows:

PROBE (1) 000
ADD ENTER-> ###

2. Press the "TANK" key to select the tank for which you wish to change the Tank probe address.

3. When the proper TANK is displayed, use the digit keys to enter the address of probe by pressing the number corresponding digit key followed by "ENTR" key.

4. If the amount displayed is correct, press the "ACK" key to acknowledge the information and exit the function.

*** NOTE THE ADDRESS IS MARKED ON THE 8190A/8150A PROBE'S NAMEPLATE, ITS VALUE MUST BE

BETWEEN 0 AND 127. IF IT ONLY HAS THE TANK NUMBER, THEN THE ADDRESS = TANK#*10.

EXAMPLE: TANK# 2 = ADDRESSS 20

ENABLE/DISABLE DELIVERY REPORT FUNCTION 132

1. Press the digits 132, then the "FUNC" key. The display shows the current status of Delivery Report. The entry prompts as follows:

   DELIVERY DISABLE
   ENTER-> #

2. Use the digit key "1" to Enable, "0" to Disable, followed by the "ENTR" key

3. Press the "ACK" to exit this function.

AUTOMATIC LEAK TEST START & STOP TIMES

FUNCTION 133

In this function the following keys have special usage:

"FUNC" - Switches between START and STOP TIME.

"ENTR" - Assigns the value typed in to selected time.

"ACK" - Exit this function.

1. Program START time for Auto leak test by pressing the keypad digits for the time you want the leak test to start, then press the "ENTR" key.

2. Press the "FUNC" key to switch to STOP TIME display.

3. Select Time to STOP the Auto leak test by pressing the keypad digits for the time you want the leak test to stop, then press the "ENTR" key.

4. Press the "ACK" key to exit this function.

*** NOTES ***

1. To Disable the auto leak test you must enter a start and stop time of 24:00.

2. The auto leak test performs a leak test on all tanks that are enabled for tank leak testing see function #128, " Enable / Disable Leak Testing".

3. To abort Auto leak test see function # 134, "Abort leak test".

4. Auto leak will cancel Manual leak test if one is running when an auto test starts.

5. Auto leak will cancel Night Monitor, if active. Then run the auto leak test, when the auto leak test is finished it will reactivate the Night Monitor Mode.

ABORT LEAK TEST

FUNCTION 134

This Function allows you to abort any type of leak test be it automatic, Manual Leak test, or Night Monitor Mode.

This function is activated by typing the function number "134" and pressing the "ENTR" key.

If any type of test is active it will be aborted and NO LEAK REPORT will be generated. Only one of the following messages will be printed on the printer:

"Auto Leak test aborted."
"Manual Leak test aborted."
"Night Monitor aborted."
"No Test Active."

SETTING THE HIHI PRODUCT/OVERFILL ALARM

FUNCTION 135

1. Press the digit key for the number of the tank which you will be assigning, followed by the "TANK" key.

2. Press digits 135, then the "FUNC" key. The display shows the tank number, the current value for the HIHI level product alarm, and the entry prompt as follows:

   I-HH ALARM (PRD)
   < 000.00> III.HH

3. Using the digits keys, enter the value (in inches) at which, if the tank level reaches, the HIHI product alarm will be triggered.

4. When the proper value is displayed, press the "ENTR" key to store the valve and exit the function.

---

* SUGGESTED ENTRY FOR HIHI PRODUCT ALARM: NO LESS THAN 8" FROM THE TOP OF THE TANK.

CHANGE THE NUMBER OF PROBES

FUNCTION 190

1. Press the digits 190, then the "FUNC" key. The display shows the current number of probes, and the entry prompt for the new number of probes, as follows:

NUMBER OF PROBES
10 ENTER NEW->##

2. Enter the number of probes by pressing the number corresponding digit key followed by "ENTR" key.

3. If the amount displayed is correct, press the "ACK" key to acknowledge the information and exit the function.

In the 19x function PROBE refers to 8160, 8165, 8170, 8180, 8185, and 8190A probes.

ENTER PROBE TYPE AND ENABLE OR DISABLE PROBE

FUNCTION 191

1. Press the digits 191, then the "FUNC" key. The display shows the Tank number, current PROBE type. The entry prompts as follows:

PROBE(5)NONE
ENTER-> #

2. Press the "TANK" key to select the tank for which you wish to change the current probe type.

3. When the proper TANK is displayed, use the digit keys

0 = NONE	5 = 8180
1 = 8160	6 = 8185
2 = 8165	7 = ENABLE
3 = DISABLE	8 = 8170B
4 = 8170	9 = 8180B
5 = 8180	10 = 8165B

or use UP and DOWN ALPHA KEYS followed by the "ENTR" key.

4. Repeat steps 2 and 3 as needed or press "ACK" to exit.

In the 19x functions PROBE refers to 8160, 8165, 8170, 8180, and 8185, 8170B, 8180B, 8165B, 8190A, and probes.

CHANGE PROBE SCAN ADDRESS

FUNCTION 192

1. Press the digits 192, then the "FUNC" key. The display shows the current address of probe, and the entry prompt for the new address of tank probe, as follows:

PROBE(1) 000
ADD ENTER-> ###

2. Press the "TANK" key to select the tank for which you wish to change the probe address.

3. When the proper TANK is displayed, use the digit keys to enter the address of probe by pressing the number corresponding digit key followed by "ENTR" key.

4. If the amount displayed is correct, press the "ACK" key to acknowledge the information and exit the function.

*** NOTE THE ADDRESS IS MARKED ON THE PROBES' NAME PLATE ITS VALUE MUST BE BETWEEN 1 AND 127, IF NOT AND IT ONLY HAS THE TANK NUMBER, THEN THE ADDRESS = (TANK - 1) * 10.

In the 19x functions PROBE refers to 8160, 8165, 8170, 8180, 8185, and 8190A probes.

CHANGE NAME of PROBE

FUNCTION 193

The name of probe by default is "PROBE" #xx" where xx is the probe number. This name will appear on a number of 8100 reports.

1. Press digits 193. then "FUNC" key the display shows the current probe name, character to be selected, and the cursor, as follows:

PROBE #01
(P)

* NOTE: There are 21 spaces available for the Probe name and 59 characters to choose from. They are as follows:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ' '
! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; <
= > ?

2. To assign the location, press the "ALPHA UP" or "ALPHA DOWN" keys until the desired symbol appears., or press the "CUR LEFT" or "CUR RIGHT" key to move the cursor.

3. Press the "ENTR" key to store that letter, and the cursor automatically moves to the next space.

4. Repeat step 2 and 3 until complete.

5. When the Probe name is complete, press the "ACK" key. This will exit the function.

In the 19x functions PROBE refers to 8160, 8165, 8170, 8180, and 8185 probes.

MCG 8190A DENSITY FUNCTIONS

The MCG 8190A tank level probe pressure sensor, used in conjunction with the MCG8100 tank monitoring system can provide product level, water level, temperature, density and API gravity of a liquid stored in an underground storage tank.

The MCG 8190A probe obtains specific gravity measurements utilizing a special pressure sensor configuration. Mounted on the end of the level probe itself is a small sensor that measures the gauge pressure exerted on the sensors diaphragm from the amount of liquid contained in the tank. This pressure, which is directly proportional to the specific gravity of the fluid being measured, is digitized by an analog to digital converter located inside the "Hockey Puck". The resulting A/D conversion is sent to the MCG 8100 upon request via the 4 "tankway wires" for processing and display. The "hockey puck" also provides the interface for the level and temperature probe to which one of the sensors is mounted.

PROGRAMMING DENSITY FUNCTIONS

Once the initial system programming has been performed, as outlined in section I of the programming manual, and calibrated tank levels and temperatures are present on the monitors display, the following procedures and programming steps are required for the MCG8100 to accurately calculate and display density.

1) Insure that the 8100 monitor is receiving data from the sensors by pressing the function key either on the keypad within the enclosure or the panel operator located on the front cover, until the raw A/D counts are shown on the display. If screen shows "no comm" follow procedures as outlined in the programming section of this manual to setup functions 190, 191 and 192.

**NOTE: The pressure ready "hockey puck" is a probe type 8190. This information is required for function 191.

2) Obtain the factory calculated "span" and "zero counts" numbers for each probe and verify these are programmed into functions 194 and 195 respectively.

3) At this point the water and product levels should have already been hand gauged and accurate levels should have been entered into functions 109 and 110.

4) Gauge the specific gravity of the liquid in the tank by another accurate means and record this number.

5) Press the function key until the specific gravity screen is on the display. With absolutely no movement in the tank, adjust the "zero counts" function 195 until the specific gravity matches the hand gauged figure. Under normal circumstances the "zero counts" adjustment by the user should never deviate by 5% of the factory furnished number. An increase in "zero counts" will cause an increase in specific gravity.

**NOTE: Due to the calculation time required by the CPU it may take up to 30 seconds for a new specific gravity result to update the display.

SET PRESSURE SPAN

FUNCTION 194

This function allows you to set to the span of the pressure sensor.

This function is activated by typing the function number "194" and pressing the "FUNC" key.

1. To enter the span value, press the digit keys for the Pressure Span value then press the "ENTR" key.

2. Press the "ACK" key to exit.

** NOTE This function is only for 8190A probes.

SET PRESSURE - SET ZERO COUNTS

FUNCTION 195

This function allows you to set to the zero counts point of 8190A type probes.

This function is activated by type the function number "195" and pressing the "FUNC" key.

1. To enter the free air value, press the digits keys for the counts then press the "ENTR" key.

2. Press the "ACK" key to exit.

**NOTE This function is only for 8190 probes .

CALIBRATE ADSISTOR TO ZERO PPM

FUNCTION 197

This function allows you to set the PPM to zero, by making the current resistance of adsistor, the base resistance.

This function is activated by typing the function number "197" and pressing the "FUNC" key.

1. To Calibrate the displayed adsistor probe to zero PPM, press the "1" key then press the "ENTR" key.

2. Press the "ACK" key to exit.

**NOTE This function is only for 81xxB vapor probes installed.

AUTO CALCULATE ZERO COUNTS FACTOR

FUNCTION 198

1. Press digits 198 then the "FUNC" key.
   PRB(1) ZERO 123
   TARGET SG -> #.####

2. Press the digit keys for the known SG, followed by the "ENTR" key.

3. The system will now display the new calculated Zero value. Function 195 will automatically be updated for you.

NOTE: You can use this function in place of the 195 function. Before you can use this function the following functions must have already been done: 123, 190, 191 and 194 and have the probe in the tank and communicating.

III. FIELD CALIBRATION

The MCG 8100 is designed for easy field calibration. Both product and water levels can be calibrated. Once the system has been put in place, programming has been completed, and product put into the tanks, initial calibration is suggested. Following initial calibration, so long as the product does not change, further calibration will not be necessary.

PRODUCT LEVEL CALIBRATION

FUNCTION 109

1. Press the digit key for the number of the tank which you will be calibrating, followed by the "TANK" key.

2. Press the digits 109, then the "FUNC" key. The display shows the calibration level, the tank number, and the entry prompt as follows:
   CAL LEVEL 0 <— If an off set is entered it
   1 - Prod. = II.HH will be displayed here.
3. Use the digit keys to enter the actual (measured) level of product in tank, then press the "ENTR" key.

4. To remove all software calibration enter 99999. (This is a key-switch protected function.)

WATER LEVEL CALIBRATION

FUNCTION 110

1. Press the digit key for the number of the tank which you will be calibrating, followed by the "TANK" key.

2. Press the digits 110, then the "FUNC" key. The display shows calibration level, the tank numbers, and the entry prompt as follows:

   CAL LEVEL 0 <— If an offset is entered it
   5 - Water = III.HH will be displayed here.

3. The digit keys are used to enter the actual (measured) level of water in the tank, then press the "ENTR" key.

4. To remove all software calibration enter 99999 (This is a key-switch protected function.)

Note: When all programming is complete, it is suggested that you make a copy of programmed parameters by using the 125 Function and keeping this report in the box for future reference.

MCG 8100 TANK MONITORING SYSTEM

OPERATING MANUAL

TABLE OF CONTENTS

I. INTRODUCTION

The MCG 8100 is a continuous liquid level monitoring device which has been designed to aid in the inventory control of fuel stored in underground tanks. The monitor measures product level, product temperature, water level and volume. This system provides volume and density.

The information, which is generated automatically, can be used to speed shift changes by eliminating tank sticking and manual report filing; to reduce inventory errors and spot losses caused by theft; leaks or meter miscalculations; and as a means of providing good inventory practice.

The MCG 8100 features reports and programmable limits that add extra security to your operation. These include automatic bulk delivery reports, programmable alarm limits to warn of overfills during deliveries, or when your inventory is running low; and high water alarm, a night movement alarm to warn of changes in inventory levels caused by theft or a tank leak during off hours.

The MCG 8100 has a night movement monitor designed to call attention to large losses identified while the system is in this mode.

All programmable alarms can actuate one or both alarm relays built into the monitor.

The MCG 8100 does not check leaks in pumps or lines. Line or pump leak must be discovered through record reconciliation or other means; such as the MCG 8160M Product Sensor or MCG 8170M Vapor Sensor, or the MCG 8165M Wet Well Sensor.

IMPORTANT NOTICE:

The information provided by the MCG 8100 should be used as part of a conscientious inventory control program. If routine inventory re conciliation reveals a loss of product, use the night movement mode or leak detect mode.

To take a closer look — if loss of product is further identified by the night monitor, call for a "L & J Precision" tightness test. Investigate repeated inventory differences even if the leak detect feature does not indicate a leak. All inventory and leak detect reports and night movement reports should be kept and reconciled.

Do not excavate tanks or take other remedial action based solely on the MCG 8100 inventory or leak detect reports.

Call your local L & J distributor to perform a precision test to confirm a suspected leak.

Even small leaks can cause severe environmental damage. It is recommended that the MCG 8100 be set regularly in it's leak detect mode when the facility is closed.

WELCOME TO AUTOMATED INVENTORY MANAGEMENT

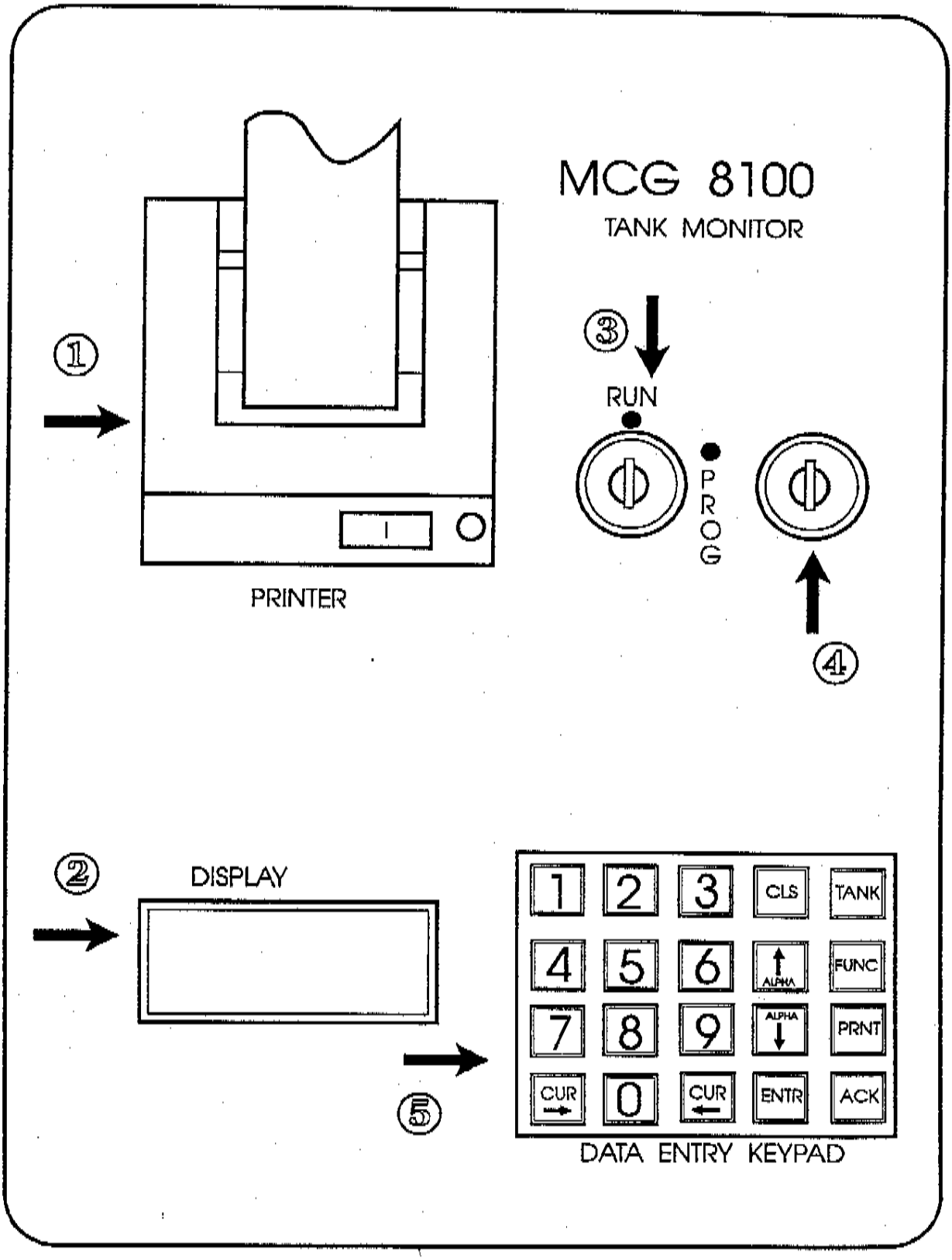
The MCG 8100 Tank Monitoring System is a versatile product, which is also very easy to use. It will make your inventory management simple, and does all the paper work for you.

The MCG 8100 Monitor is equipped to give you a local readout of all tank information, as well as printed informational reports, at any time. The readout is given through a 32 digit alphanumeric LCD display, and the printouts are generated from the built-in printer. The basic MCG 8100 system will provide you with the following information:

DAY, DATE AND TIME
TANK NUMBER AND PRODUCT NAME
PRODUCT LEVEL AND VOLUME
WATER LEVEL AND VOLUME
TANK T EMPERATURE
TEMPERATURE COMPENSATED NET VOLUME
DELIVERIES
TANK/PUMP RECONCILIATION
UNATTENDED TANK MOVEMENT
ALARMS FOR UNWANTED CONDITIONS
SPECIFIC GRAVITY

The way to retrieve this information, on the display, and the printout, will be discussed in detail, on the following pages.

II. FRONT PANEL LAYOUT



III. FRONT PANEL & INTERNAL COMPONENT EXPLANATION

FRONT PANEL LAYOUT...The front panel, or face of the MCG 8100 is laid out for easy operation.

1. THE PRINTER - The printer generates all hard copy printouts. The ON-OFF switch for the printer is located on the bottom of the built-in unit. Putting the printer in the "ON" position activates the printer. Whenever the printer is printing, this light will show. During standard operations, the printer must be on. The printer can only be accessed when the explosion proof enclosure is opened.

2. THE DISPLAY - The display shows the following information for each tank: Located on the front cover.

Tank# & Product I.D. TANK #1 REGULAR
Product Level PLEV 76.349 7,345
WLEV 6.34 634
63.2F ULLAGE 2,395
OR
Tank# & Product I.D. 1 - REGULAR (WATER) Water Indicator Water Level 1.00" 19 Water Volume
OR
FRI. 10 JUL 1987
TIME 10:46:48
OR
VAP PROD WATER Interstitial
DET/OK DET/OK DET/OK Probe or Sump Status

When the MCG 8100 is not giving tank information, the display can show the date and time, as shown above.

3. FRONT PANEL OPERATORS - The front panel provides push buttons for the tank acknowledge and function key. The functions of these keys are identical to those examples are in Section 4.

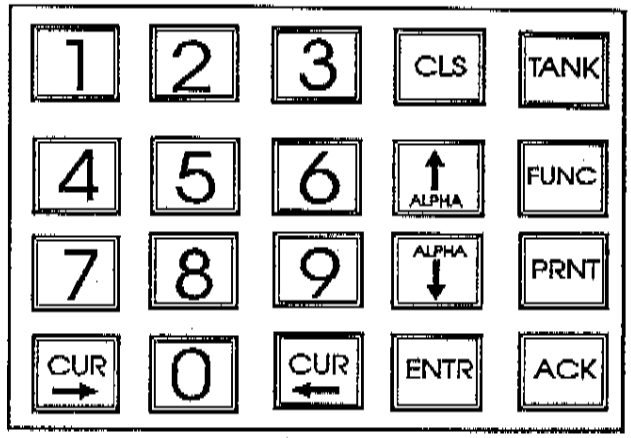
4. THE KEYPAD - The keypad is a series of buttons which are used to program, and operate the system. For standard operations, the customer need only be familiar with a few of the buttons. They are:

1. The Tank Key - TANK
2. The Function Key - FUNC
3. The Print Key - PRNT
4. The Acknowledge Key - ACK
5. The Close-Out Key - CLS

As you will read in the following pages, these 5 keys, along with some of the digit keys, are all you need to know.

IV. KEY FUNCTIONS - STANDARD OPERATIONS

During standard operations of the MCG 8100 Monitor, only five of the keys on the keypad are routinely used. These keys and the functions they perform are as follows:



1. The TANK key is used to select the tank from which you will be getting information. Each press of the TANK key will move the display to read the next tank.

SHORTCUT - If you have a particular tank from which you want information, simply press the digit key for the desired tank number, followed by the TANK key.

EXAMPLE: If you'd like information from tank 6, press the #6 digit key, then the TANK key.

2. THE FUNCTION KEY (FUNC) - The function key is used to select the type of tank information desired. 4 sets of information can always be displayed for each tank; they are as follows:

1. THU. 10 JUL 1987 3. 2 - REGULAR (WATER)
TIME 11:29:51 1.00" 19
DAY, DATE AND TIME WATER INFORMATION

2. 2 - REGULAR 73'F 4. 2 - REGULAR 73'F
78.12" 8461 78.12" 8461

PRODUCT INFORMATION PRODUCT INFORMATION REPEATED

Pressing the function key, moves the display to the next function, in the order shown above:

3. THE PRINT KEY (PRNT) - The print key is used whenever an inventory report is desired. Pressing the print key, at any time, will generate a report with information about the tank displayed. For a total tank inventory report, press the #1 digit key, followed by the print key. This will give you a report for all tanks at once. For an alarm history report press the 2 digit key, followed by the print key.

COMMAND SUMMARY
PRNT - Inventory Report For Displayed Tank
1PRNT - Inventory Report For All Tanks
2PRNT - Alarm History Report

4. THE ALARM ACKNOWLEDGMENT KEY (ACK) - This key is pressed when an alarm has been set off. Pressing the button will stop the alarm and generate a report stating that the alarm was acknowledged, the time and data it was acknowledged, and the conditions at the time of the acknowledgment.

5. THE CLOSE-OUT KEY (CLS) - The close-out key triggers the machine to do pump/tank reconciliation. These are usually performed at the end of a shift, or the end of a day.

STEPS FOR A CLOSE-OUT

1. Press the CLS key, the readout should display the following:

TNK 1 TOTAL = 0
PUMP ENTRY= #####

at this point, a report will begin to be generated.

2. Begin entering pump totals for that tank. Enter the amount using the digit keys, followed by the enter key for each entry. Pressing the enter key automatically totals the pump amounts.

3. When all of the pump totals are entered for tank 1 press the CUR <- key. A close-out for tank 1 will be generated, and the display moves to the next tank.

4. Repeat the same steps for all tanks.

SAMPLE CLOSE-OUT REPORT

```
MCG 8100 TANK MONITOR

** BEGIN CLOSE OUT **
05/01/95  10:02:14

TANK #1 — REGULAR
PRESENT TMP = 76'F
PREVIOUS TMP = 76'F
PRESENT VOL = 7500
PREVIOUS VOL = 8000
DELTA TNK VOL = -500

DELIVERYVOL = 2000

PUMP TOTALS = 2500
DELTA VOLUME = 0

** END CLOSE OUT **
```

PRESENT TANK TEMPERATURE-
TANK TEMP O F LAST CLOSEOU
PRESENT TANK VOLUME
TANK VOL. OF LAST CLOSE-OU
DIFF. IN TANK VOL. SINCE LAS CLOSE-OUT
ALL DELIVERIES SINCE LAST CLOSE-OUT
TOTAL VOLUME PUMPED
DIFFERENCE BETWEEN AMOUN PUMPED AND VOLUME CHANGE

V. INVENTORY FEATURES OF THE MCG 8100

Here is a brief summary of the inventory management features offered by the MCG 8100 Tank Monitoring System.

INVENTORY REPORTS - Printed reports giving all tank information. Inventory reports can be generated automatically, up to six times a day, when programmed into the system at the initial set-up, by the programmer. Or, an individual tank inventory report can be generated instantly, with the touch of a button.

DELIVERY REPORTS - These reports are generated automatically. When the MCG 8100 Tank Monitoring System, senses an increase in the tank level and volume, it gives a delivery report at the end of this increase. The report gives all of the delivery and tank information.

NIGHT MONITOR - During unattended hours, the MCG 8100 can monitor your tanks automatically. Switching to the night mode, the system acts as a guard against thefts and leaks through automatic reports. These reports are generated whenever the system detects any tank activity. To get into the night mode, simply press the "8" digit key followed by the FUNC key. To get out of the night mode, press the"9" digit key followed by the FUNC key. In each instance a printout will give you your current status.

ALARMS - Alarm set points can be set for high and low product, and high water. When these points are reached, an alarm will sound, warning you of the conditions. An automatic report is also generated indicating the alarm conditions. (The alarm set points are programmed into the system at set-up by the programmer).

CLOSEOUTS - PUMP/TANK RECONCILIATION - A valuable feature for keeping up-to-date records of inventory and sales.

VI. SYSTEM REPORT GENERATION

The MCG 8100 Tank Monitor is capable of generating several different reports: product inventory, individual tank inventory, product delivery, alarm indication, night movement for leak detection and product theft, alarm summary and programmed parameters.

REPORT DESCRIPTIONS

The INVENTORY REPORT can be printed by depressing the print button. It will print out the inventory for the tank which is currently selected. To obtain a complete inventory report for all tanks type in 1, then depress the print key.

The report contains complete information on all tanks and includes customer name, date and time, tank number, product, gallons of fuel, inches of fuel, inches of water, temperature and gravity. This report may also be printed automatically six times a day, using the programmable auto print time feature. (See Function 112). The DELIVERY REPORT is printed within the delay time which has been programmed. It contains the increase in tank volume. This report also gives the delivery and tank information.

The delivery feature measures beginning and ending volume to calculate net volume increase. It does not compensate for fuel dispensed during either the bulk delivery or the inventory increase delay time.

To turn on the NIGHT MOVEMENT depress the 8 function. This will monitor all tanks, and generate a report on any decrease in product level. This report will give the time of the occurrence and the level.

STATION CLOSEOUT/PUMP & GAGE RECONCILIATION

This report gives the Delta change in inventory over a period of time and is used to compare the pump and gage data.

```
MCG-8100  TANK  MONITOR

  * * BEGIN CLOSE OUT * *

TANK # 1   ---  NO LEAD

PRESENT TEMP =      69 F
PREVIOUS TEMP=      75 F
PRESENT VOL  =      53
PREVIOUS VOL =      0
DELTA TNK VOL=      53
DELIVERY VOL =      -1
PUMP TOTALS  =      12345
DELTA VOL    =      12399

  * * END CLOSE OUT * *
```

ALARM INDICATOR REPORTS

On any type of alarm, e.g., High level (DET/CLR), Low level (DET/CLR), High water (DET/CLR), Vapor (DET/CLR), Product (DET/CLR), Water (DET/CLR).

```
ALARM DET - VAP. PROBE
05/01/95              12:21:56
   TANK # 1 ---       NO  LEAD
PROD  LEVEL  =        5.87"

ALARM DET - HI PROD
05/01/95              22:31:50
   TANK # 1 ---       NO  LEAD
PROD  LEVEL  =        35.87"
```

ALARM HISTORY REPORTS

Same as above. The 126 and 127 functions are used to generate or clear alarm history reports. The system will automatically store the last 24 hours of alarm history.

```
ALARM DET - VAP. PROBE
05/01/95              12:21:56
   TANK # 1 ---       NO  LEAD
PROD LEVEL   =        5.87"

ALARM DET - HI PROD
05/01/95              22:31:50
   TANK # 1 ---       NO  LEAD
PROD LEVEL   =        35.87"
```

DELIVERY REPORT

The delivery report is automatically printed on receipt of deliveries. The report provides beginning and ending volumes as well as net product increase.

NOTE: the report does not compensate for fuel dispensed during delivery or during inventory increase delay time.

```
MCG-8100  TANK  MONITOR

   * * END DELIVERY * *
05/01/95    11:31:27

TANK # 1   --- NO LEAD

PROD LEVEL    =     9.50"
VOLUME        =     095
WATER LEVEL   =     0.00"
VOLUME        =     000
TEMPERATURE   =     67.8F
API GRAVITY   =     65.0
START LEVEL   =     10.37"
STOP LEVEL    =     11.62"
START TEMP    =     67.4F
STOP TEMP     =     67.8F
START VOL     =     103
STOP VOL      =     116
DEL VOL       =     012
START NET     =     102
STOP NET      =     115
DEL NET       =     012
```

NIGHT MOVEMENT

When activated the night movement alarm will generate a report whenever there is a decrease in level.

```
MCG-8100  TANK  MONITOR

* * NIGHT MOVEMENT * *
  05/01/95   11:31:27

TANK # 1   ---  NO LEAD

PROD LEVEL   =    7.50"
VOLUME       =    095
WATER LEVEL  =    0.00"
VOLUME       =    000
TEMPERATURE  =    67.8F
API GRAVITY  =    65.0
NET VOL      =    094
```

No net tank leak detected or leak rate less than 0.20 G/HR

```
MCG-8100 TANK MONITOR

LEAK TEST IN PROGRESS
      ON TANK # 1
  05/01/95   11:31:27
* LEAKAGE SUMMARY *
TANK # 1  --- NO LEAD

L & J TECHNOLOGIES
5911 BUTTERFIELD ROAD
MCG-8100 TANK MONITOR

START TIME    =     00:00
END TIME      =     20:00

CHANGE        =     0
DURATION TIME 20:00
NO LEAKAGE DETECTED

LEAK TEST COMPLETE ON TNK # 1
05/01/95      11:51:27
```

Leak rate greater than 0.20 G/HR

```
MCG-8100 TANK MONITOR
LEAK TEST IN PROGRESS
      ON TANK # 1
  05/01/95   11:31:27
* LEAKAGE SUMMARY *
TANK # 1  --- NO LEAD
L & J TECHNOLOGIES
5911 BUTTERFIELD ROAD
MCG-8100 TANK MONITOR
START TIME    =     00:00
PROD TEMP     =     78.2F
PROD LEVEL    =     46.62"
PROD VOL      =     3015.00
PROD NET VOL  =     2975.85
WAT LEVEL     =     15.62"
WAT VOL       =     840.37
TNK NET VOL   =     3816.22

END TIME      =     00:00
PROD TEMP     =     78.2F
PROD LEVEL    =     46.50"
PROD VOL      =     3003.00
PROD NET VOL  =     2964.00
WAT LEVEL     =     15.62"
WAT VOL       =     840.37
TNK NET VOL   =     3804.37

CHANGE
DURATION      =     23:30
PROD TEMP     =     00.0F
PROD LEVEL    =     0.12"
PROD VOL      =     -12.00
LEAKAGE RATE
      -0.510 GAL./HOUR
WAT LEVEL     =     0.00
WAT VOL       =     0.00
NO LEAK DETECTED
TNK NET VOL   =     -11.84
LEAKAGE RATE
    -0.504 GAL./HOUR
LEAK TEST COMPLETE TANK # 1
05/01/95          11:54:57
```

8100 ASCII COMMUNICATION

The RS-232 Communication port can provide tank information to a remote MG3800 computer system. Using the following communication protocol.

READ REQUEST COMMAND:

RD<-'	or "Read all configured tanks"
RD#<-'	or "Read Tank #1-9"
RD##<-'	or "Read Tank ## 10"

"RD" = Read

or ## one or two digit tank number
<-' = Carriage return, 13,)D hex

If tank number is zero or no tank number is given 8100 will transmit data for all tank configured on system, 8100 will not respond to read requests with tank number greater than configured number

RETURN MESSAGE FORMAT:

tt,	ppp.pp	ttt.t,	qqqqq,
TANK	PRODUCT LEVEL	TANK TEMP	GROSS VOLUME

www.ww,	vvvvv	<-'
WATER LEVEL	WATER VOLUME	CARRIAGE RETURN

NOTE: All fields are numeric and right justified space filled, and comma separated.

MCG 8100 TANK MONITORING SYSTEM

TROUBLESHOOTING

TABLE OF CONTENTS

SECTION I INTRODUCTION

GENERAL INFORMATION

The troubleshooting and repair instructions contained in this manual are intended for servicing the MCG 8100X Tank Level Sensor manufactured by L & J Technologies, 5911 Butterfield Road, Hillside, IL 60162.

IMPORTANT: THIS MANUAL IS INTENDED FOR USE BY EXPERIENCED TECHNICIANS WHO HAVE KNOWLEDGE OF THE MCG 8100X TANK MONITOR, AND OF PROPER SERVICE TECHNIQUES FOR ELECTRONIC EQUIPMENT.

Prior to servicing the MCG 8100X, the information contained in the following L & J manuals should be reviewed and understood.

L & J MCG 8100X Installation Manual
L & J MCG 8100X Programming Manual
L & J MCG 8100X Operating Manual

These manuals should be available during a service call for use as reference if required.

MANUAL ORGANIZATION

This manual contains information to establish proper procedures to be followed during a service call. The system troubleshooting helps you identify the problem and leads you to the information required for corrective action. In addition, detailed instructions are included for the removal and installation of parts and components.

SECTION II. BEFORE YOU START!

BASIC PROCEDURES

To help ensure proper and safe troubleshooting and repair procedures for the MCG 8100X, the following steps should be taken IN THE ORDER THEY APPEAR, PRIOR TO SERVICING THE SYSTEM:

1. Review and thoroughly understand the safety warnings on page 1 in the Introduction Section of this manual.

FAILURE TO READ THESE WARNINGS CAN RESULT IN DEATH, SERIOUS PERSONAL INJURY, AND EQUIPMENT DAMAGE CAUSED BY EXPLOSION OR ELECTRICAL SHOCK.

2. Review the System Layout.

3. Perform an intrinsic safety check.

IF THE SYSTEM FAILS THE INTRINSIC SAFETY CHECK, TURN THE AC POWER CIRCUIT BREAKER AT THE SERVICE PANEL TO THE OFF POSITION, DISCONNECT AND CAP THE AC WIRES IN THE MONITOR, AND DISCONNECT AND CAP ALL PROBE FIELD WIRES IN THE PROBE JUNCTION BOXES.

4. Print out all system and tank setup parameters (function 125) and save the tape.

SETUP PARAMETERS CAN BE LOST DURING SOME SERVICE PROCEDURES! THIS PRINTOUT WILL ALLOW YOU TO RE-PROFILE THE SYSTEM WITH THE SAME PARAMETERS WHEN SERVICE IS COMPLETE.

5. Perform the visual equipment inspection.

6. Refer to the System Troubleshooting Procedure to identify probable cause of the symptom and follow the instructions shown under Troubleshooting/Corrective Procedure.

SECTON III. TROUBLESHOOTING

A. TROUBLESHOOTING PROCEDURE

1. To check incoming AC power.

   a. Using a voltmeter set on AC volts, check terminals 1 and 2 on TB1.

   b. The voltage should measure 16VAC + 20%.

   c. If the voltage is zero, check input voltage and circuit breaker on the input to the transformer, for 115VAC.

d. To check that the 16VAC is getting into the box, put the meter between TB1 and both sides of the fuse. You should have 16VAC on both sides of the fuse.

2. To check the +12VDC on the unit, put your voltmeter on the red and black terminals of the battery.

3. To check the +5 volts on the CPU board, put your meter on a low DC voltage range and check between the ground on the battery and the inductor L1 right side. Voltage should measure +4.7 to 5.3VDC.

4. To check supply voltage to the MCG 8150 Probes, check across terminals P & G on the intrinsic barriers. The voltage should read approx. 14VDC. This voltage may vary based on the load (number of probes) but should not be lower than +10.6VDC.

5. To check the key switch use caution and disconnect AC power to the MCG 8100X. Put your meter across the orange and yellow wires on plug coming into CPU. When switch is in PROG mode, there should not be any continuity. When the switch is in the RUN mode, the wires should be shorted.

MCG 8160, 8165, 8170,8190

The probes on the MCG 8160, 8165 and 8170 can be used as stand alone or can be added to existing MCG 8100X equipment to monitor product in interstitial tank spale, sumps and wells.

The MCG 8160 probe can be used in the annular space of a dual wall tank or in a sump. The probe is capable of detecting water and product in this application. The 8160 can also be part of the MCG 8150 level sensing probe, or a stand alone unit.

Typical Display on MCG 8100X Monitor	PRD	WATER	VAP
	OK	OK	
	OR	OR	
	DET	DET	

The MCG 8170 is designed to detect hydrocarbon vapors in a dry well. It is not meant for use in a wet well.

Typical Display on MCG 8100X Monitor	PRD	WATER	VAP
	OK	OK	XXXX
	OR	OR	
	DET	DET	

The MCG 8165 is designed to detect hydrocarbons in a wet well. The probe is suspended from a cable and the float normally floats on top of the water in the well. This probe is also capable of detecting hydrocarbon vapors. There are adjustment screws on the float to vary the sensitivity of detection for hydrocarbons.

Typical Display on MCG 8100X Monitor	PRD	WATER	VAP
	???	OK	XXXX
	OR	OR	
	DET	DET	

The MCG8190 is designed to calculate the density of the product, based on the difference between the atmospheric pressure and the pressure from the product sensor located at the bottom of the 8150A probe.

Typical Display on MCG8100X Monitor.